ZooKeys 827: 31–124 (2019)
doi: 10.3897/zookeys.827.31365
http://zookeys.pensoft.net

CHECKLIST

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

Mollusc species from the Pontocaspian region – an expert opinion list

Frank P. Wesselingh[1], Thomas A. Neubauer[1,2], Vitaliy V. Anistratenko[3], Maxim V. Vinarski[4,5], Tamara Yanina[6], Jan Johan ter Poorten[7], Pavel Kijashko[6], Christian Albrecht[2], Olga Yu. Anistratenko[3,9], Anouk D'Hont[10], Pavel Frolov[4], Alberto Martínez Gándara[11], Arjan Gittenberger[10], Aleksandre Gogaladze[1], Mikhail Karpinsky[12], Matteo Lattuada[2], Luis Popa[11], Arthur F. Sands[2], Sabrina van de Velde[1], Justine Vandendorpe[2], Thomas Wilke[2]

1 *Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands* **2** *Department of Animal Ecology and Systematics, Justus Liebig University, Heinrich-Buff-Ring 26–32 IFZ, 35392 Giessen, Germany* **3** *Department of Invertebrate Fauna and Systematics, Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, B. Khmelnytsky Str. 15, 01030 Kiev, Ukraine* **4** *Laboratory of Macroecology and Biogeography of Invertebrates, Saint-Petersburg State University, 7/9 Universitetskaya Naberezhnaia, 199034 Saint Petersburg, Russia* **5** *Omsk State Pedagogical University, Tukhachevskogo Emb. 14, 644099 Omsk, Russia* **6** *Moscow State University, Faculty of Geography, Leninskie Gory 1, 119991 Moscow, Russia* **7** *Department of Zoology (Invertebrates), Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605–2496, USA* **8** *Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, 199034 St. Petersburg, Russia* **9** *Department of Cainozoic Deposits, Institute of Geological Sciences, National Academy of Sciences of Ukraine, O. Gontchar Str. 55b, 01054 Kiev, Ukraine* **10** *Gittenberger Marine Research, Inventory & Strategy (GiMaRIS), BioScience Park Leiden, J.H. Oortweg 21, 2333 CH Leiden, The Netherlands* **11** *Grigore Antipa National Museum of Natural History, Sos. Kiseleff Nr. 1, 011341 Bucharest, Romania* **12** *Russian Federal Research Institute of Fisheries and Oceanography, V. Krasnoselskaya 17, 107140 Moscow, Russia*

Corresponding author: *Frank P. Wesselingh* (frank.wesselingh@naturalis.nl)

Academic editor: *E. Neubert* | Received 5 November 2018 | Accepted 20 December 2018 | Published 5 March 2019

http://zoobank.org/10B66389-5E42-4E52-87D8-F49E2405D651

Citation: Wesselingh FP, Neubauer TA, Anistratenko VV, Vinarski MV, Yanina T, ter Poorten JJ, Kijashko P, Albrecht C, Anistratenko OYu, D'Hont A, Frolov P, Gándara AM, Gittenberger A, Gogaladze A, Karpinsky M, Lattuada M, Popa L, Sands AF, van de Velde S, Vandendorpe J, Wilke T (2019) Mollusc species from the Pontocaspian region – an expert opinion list. ZooKeys 827: 31–124. https://doi.org/10.3897/zookeys.827.31365

Abstract

Defining and recording the loss of species diversity is a daunting task, especially if identities of species under threat are not fully resolved. An example is the Pontocaspian biota. The mostly endemic invertebrate faunas that evolved in the Black Sea – Caspian Sea – Aral Sea region and live under variable salinity conditions are undergoing strong change, yet within several groups species boundaries are not well established. Collection efforts in the past decade have failed to produce living material of various species groups whose taxonomic status is unclear. This lack of data precludes an integrated taxonomic assessment to clarify species identities and estimate species richness of Pontocaspian biota combining morphological, ecological, genetic, and distribution data. In this paper, we present an expert-working list of Pontocaspian and invasive mollusc species associated to Pontocaspian habitats. This list is based on published and unpublished data on morphology, ecology, anatomy, and molecular biology. It allows us to (1) document Pontocaspian mollusc species, (2) make species richness estimates, and (3) identify and discuss taxonomic uncertainties. The endemic Pontocaspian mollusc species richness is estimated between 55 and 99 species, but there are several groups that may harbour cryptic species. Even though the conservation status of most of the species is not assessed or data deficient, our observations point to deterioration for many of the Pontocaspian species.

Keywords

Aral Sea, bivalves, Black Sea, Caspian Sea, conservation, gastropods, nomenclature, taxonomy

Introduction

The aquatic Pontocaspian (or Ponto-Caspian) biota is constituted by taxa that evolved in saline water bodies in the Caspian Sea – Black Sea – Aral Sea region and surrounding rivers in the past few million years. They include diverse groups such as diatoms, dinoflagellates, foraminiferans, crustaceans, molluscs, as well as fish and the Caspian seal. Major Pontocaspian habitats are located in the northern coastal zone of the Black Sea (mostly confined to the Romanian and Ukrainian coasts) and the Sea of Azov (mostly in the Taganrog Bay), cover the entire Caspian Sea and, until recently, the Aral Sea (Fig. 1). However, Pontocaspian habitats are impacted by human activities such as pollution, habitat modification and introduction of invasive species (Bologa et al. 1995, Zolotarev 1996, Zaitsev and Mamaev 1997, Gomoiu et al. 2002, Grigorovich et al. 2003, Occhipinti-Ambrogi and Savini 2003, Barannik et al. 2004, Shalovenkov 2005, UNEP 2006, Stolberg et al. 2006, Selifonova 2008a, b, Popa et al. 2009), as well as the entire obliteration of environments in the case of the Aral Sea in the second half of the 20th century (Mainguet and Létolle 1997, Andreeva and Andreev 2003, Plotnikov et al. 2016).

Faunas in the Pontocaspian region have strongly changed in the past century. Pontocaspian species that were abundant only a century ago, such as *Dreissena elata* and *D. caspia* in the Caspian Sea, have vanished in the mid-20th century (Kosarev and Yablonskaya 1994). For the Aral Sea, the faunas appear to have largely disappeared with the demise of the lake system since the 1950s (Andreeva and Andreev 2003). Abundances of several other species in the Caspian Sea and Black Sea Basin have severely declined (Bologa et al. 1995, Zaitsev and Mamaev 1997, Barannik et al. 2004, Popa et al. 2012).

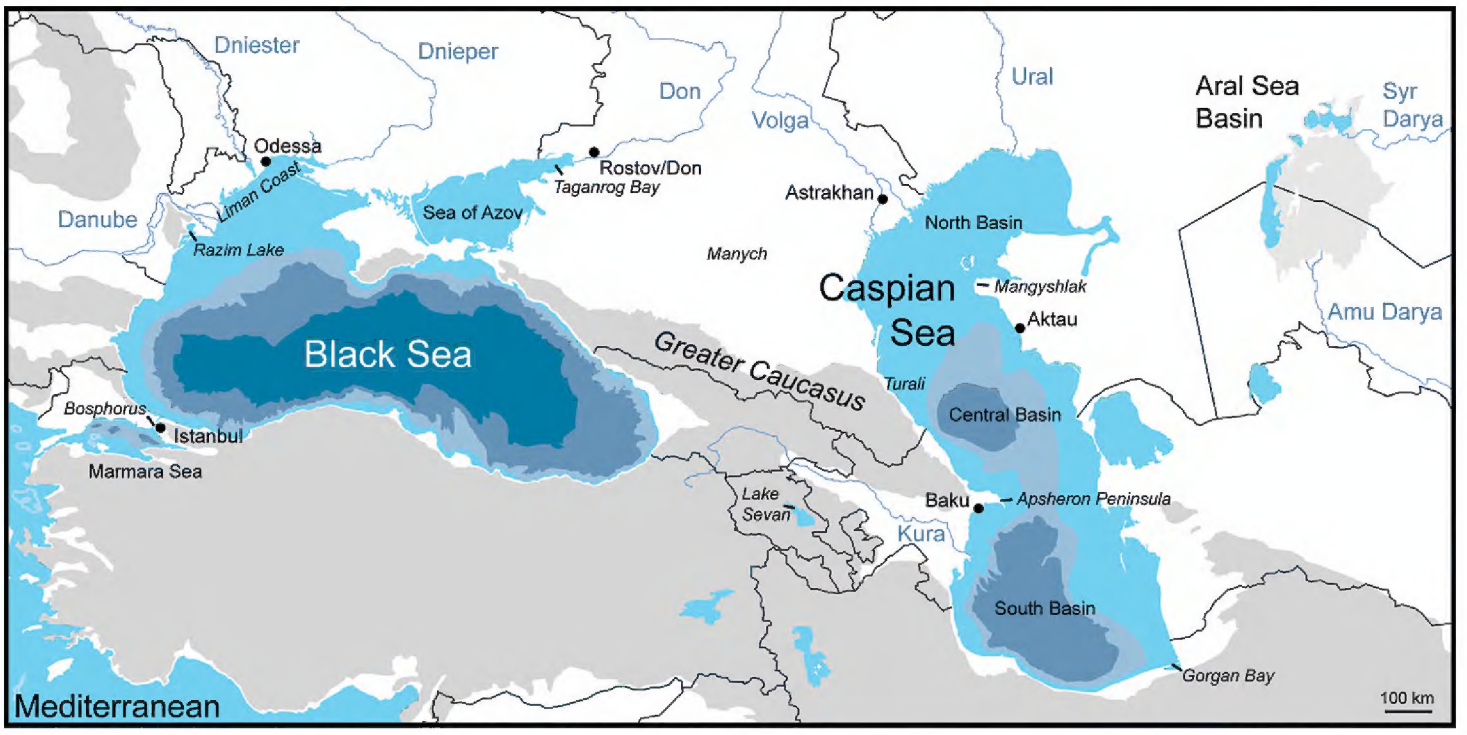

Figure 1. Map of the Pontocaspian region with the indication of major basins, rivers, regions, and cities referred to in the text.

However, we cannot evaluate the extent or nature of biodiversity loss as there is no general agreement on the species that it might concern. Much of the diversity in Pontocaspian mollusc groups is contained within a limited number of genera. Changing taxonomic approaches through time (e.g., Zhadin 1952, Logvinenko and Starobogatov 1969, Alexenko and Starobogatov 1987, Sitnikova and Starobogatov 1999, Munasypova-Motyash 2006a, b, Anistratenko 2007b, Kijashko in Bogutskaya et al. 2013, Vinarski and Kantor 2016, Neubauer et al. 2018) combined with large morphological variability and few diagnostic characters in certain groups, as well as the paucity of living material and partial disappearance of type material, has precluded critical reassessment of species boundaries and thus species richness. For the Caspian Sea, multiple efforts to collect fresh material in the past decade failed to produce sufficient living material to elucidate these taxonomic matters for most of the groups. Sampling efforts include coastal sampling around Turali, Russia (FW, 2003); northern Azerbaijan (FW, 2016), middle and southern Azerbaijan (VA, ML, AFS, TW, 2017); Mangyshlak region coastal areas, Kazakhstan (OA, VA, 2016, 2017); the transition of the northern to middle Caspian Sea Basin in Kazakhstan (PRIDE expedition, 2017); and the Gorgan Bay in Iran (AFS, 2018). A faunal inventory of the deep-water southern Caspian Sea Basin (> 200 m water depth) of southern Azerbaijan was published lately by Mirzoev and Alekperov (2017). We are uncertain whether it concerns living material nor can we assess the species identities. Their records are mentioned below but require further confirmation. We did find some living endemic species ourselves, and from coastal areas low numbers of such species have been reported elsewhere (e.g., Latypov 2015). Yet, many species and even groups of species (e.g., *Turricaspia* species) have not been encountered alive despite our attempts. Our inability to collect life specimens for several groups has made

a combined molecular-morphological approach to delineate species impossible. As a result, a reliable estimate of the number of species involved is lacking, and therefore the potential magnitude of the biodiversity decline is speculative. Hence, we need an alternative approach to outline the species boundaries and estimate the numbers affected.

By pooling all insights, data (published and unpublished) and expert opinions on the Pontocaspian mollusc species through taxonomists we aim to provide a list of Pontocaspian mollusc species that can serve as a base for further research. We use molluscs as a model group since they are (1) an important, representative and well-known part of the Pontocaspian fauna, (2) have a number of taxonomic specialists available, and (3) can often be identified based on their shell characters even when living populations have vanished. The Pontocaspian aquatic mollusc species list will highlight uncertainties in species complexes as to give guidance to further research in resolving taxonomic matters. The aim of this work is to compile a list of Pontocaspian mollusc species with the underlying arguments why we consider these species as (likely) valid species, to outline taxonomic uncertainties and to provide an updated estimate of species richness.

Materials and methods

A preliminary Pontocaspian mollusc species list was assembled during a PRIDE program workshop in Giessen, Germany, in May 2018. The PRIDE ("Drivers of Pontocaspian Rise and biodiversity Demise") program is an EU funded Innovative Training Network that studies the drivers of the rise and demise of Pontocaspian faunas. Using listings in Vinarski and Kantor (2016) supplemented with further information from the participants, this initial list was then circulated among a wider community of taxonomic workers for further updates and comments. Data on distribution and type material were derived from Vinarski and Kantor (2016) and further completed and amended. The systematic order above the species level follows Bouchet et al. (2017) and MolluscaBase (2018a). In cases where we deviate from the supraspecific classification, arguments are discussed below.

The list comprises aquatic Holocene Pontocaspian mollusc faunas. A substantial number of Pontocaspian species has been described from empty shells from beach material or derive from grab samples. Such samples typically are dominated by time-averaged Holocene shell assemblages, which may or may not yield living specimens and in very rare occasions also contain older (Pleistocene) material (see, e.g., Leroy et al. 2018). For the Black Sea Basin, the Holocene time interval largely coincides with the date of the marine flooding through the Bosphorus and subsequent marginalisation of Pontocaspian species to the NW coastal zone (Danube Delta to Dnieper Estuary) and the Sea of Azov (Mordukhay-Boltovskoy 1960). For the Caspian Sea, the time interval corresponds to the so-called Novocaspian period that started after the very deep Mangyshlak regression 8 ka (Fedorov 1953, Nevesskaja 1958, 2007, Yanina 2005). The time interval contains the earliest impact of humans on native faunas, such as the introduction of *Cerastoderma glaucum* in the Caspian Basin during the early Holocene (Fedorov 1957, Yanina 2009). It also contains the large faunal changes of the 20th century related to pollution, invasive species, and obliteration of habitats (Kosarev and Yablonskaya 1994).

Table 1. Definitions we use to characterise the status of species.

Pontocaspian	Centre of evolutionary history in Pontocaspian lakes
Native	Present in the Pontocaspian region today and in the Quaternary (not introduced by man) but centre of evolution not necessarily in that region: e.g., planorbid species with a Palearctic distribution, *Cerastoderma glaucum*.
Introduced	Species introduced in the Pontocaspian from elsewhere, usually anthropogenic: some Pontocaspian species have migrated between Pontocaspian basins and their status is explained in detail there (e.g., *Monodacna colorata/Dreissena bugensis*: introduced in Caspian from natural ranges in Black Sea Basin).
Invasive	Species that have become disruptive in the ecosystem after introduction.

One of the greatest difficulties is to establish the identities of taxa reported as geographic subspecies. Many species have forms, varieties, and subspecies described from the Aral Sea, the Caspian Sea Basin, and the Black Sea Basin (including the Azov Sea). Often, such distinctions are made based on the geographical isolation alone or on a range of morphological characters whose variation seems to be overlapping in geographical subpopulations. In order to assess whether the geographical populations are indeed species, we need combined morphological, ecological, and molecular data, but only few studies produced this information to date (e.g., Popa et al. 2012 for Black Sea Basin *Monodacna*). For the Aral Sea, we expect difficulties to obtain fresh material of almost all species for molecular analyses due to the obliteration of most of the lake and its fauna in the 20th century (Andreeva and Andreev 2003, Plotnikov et al. 2016). To date, hardly any molecular data on closely related species that are (potentially) shared between the Caspian and Black Sea have been published with the exceptions of *Dreissena grimmi/D. bugensis* (e.g., Therriault et al. 2004, Stepien et al. 2013) and *Ecrobia maritima/E. grimmi* (Haase et al. 2010). For several potentially shared species, ecological tolerances and preferences between Caspian and Black Sea Basin populations are overlapping, but in some cases (like for *D. grimmi/D. bugensis*) they are not. We have adopted a conservative approach, and as long as no additional arguments (morphological, ecological, or genetic differences) were found, we consider the Aral, Caspian and Black Sea varieties/subspecies synonyms. Another difficulty in especially Caspian taxa is the erection of so-called "bathymetric" subspecies, which seem to be distinguished mostly based on their depths of occurrence. As long as no other (morphological, genetic) arguments are available, we synonymise such bathymetrical forms.

A listing of synonyms and important past misidentifications from the literature is given. The list is not exhaustive and intended to show major shifts in taxonomic thinking about Pontocaspian and invasive species. The format of synonymy lists follows mostly suggestions of Matthews (1973). Asterisks in front of a record indicate valid first descriptions, a superscript "o" a prior yet invalidly introduced synonym. The status of each species is defined according to criteria outlined in Table 1.

As for the conservation status we have indicated the IUCN Red List status as of July 2018 from [www.iucnredlist.org] and added our own observations. For updated stratigraphic terminology and age estimates we refer to Krijgsman et al. (2019).

Abbreviations used are:

ZIN Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia.
RGM Naturalis Biodiversity Center, collections of fossil Mollusca, Leiden, The Netherlands.

For personal observations of the various authors we used the following abbreviations:

FW Frank P. Wesselingh,
TN Thomas A. Neubauer,
VA Vitaliy V. Anistratenko,
OA Olga Anistratenko,
AFS Arthur F. Sands,
MV Maxim V. Vinarski,
TW Thomas Wilke.

Finally, with the long literature record and various languages involved we came across some problems in spellings of geographical names and authors that we could not always resolve. Often, the transliteration of Russian names into French, German, and English literature resulted in different spellings, for example Ostroumoff/Ostroumov, Andrussoff/Andrussow/Andrusoff/Andrusov, and Apsheron/Absheron. We have followed the translations that are used by most the Russian-language authors of this paper but in some cases denote the different available spellings.

Systematic catalogue

Bivalvia

Remarks. Within the endemic bivalve species groups, a general lack of combined molecular, morphological, and ecological approaches has led to partially unresolved taxonomy, especially within the genera *Monodacna* and *Dreissena*. Much of the bivalve taxonomy follows the latest review of Caspian bivalves by Kijashko in Bogutskaya et al. (2013), and we discuss deviations from his schedule. The list of Aral bivalves published by Vinarski and Kantor (2016) is based chiefly on Andreeva and Andreev (2003), and it is used here as a base with appropriate changes in nomenclature.

Family Mytilidae Rafinesque, 1815

Mytilaster minimus (Poli, 1795)

*1795 *Mytilus minimus* Poli: 209–210, pl. 32, fig. 1.
1932 *Mytilaster lineatus* (Gmelin, 1790). – Bogachev: 38, pl. 1, figs 5–11 [**non** *Mytilus lineatus* Gmelin, 1791].
1952 *Mytilaster lineatus* (Gmelin, 1789). – Zhadin: 285, fig. 248 [**non** Gmelin, 1791].

1969 *Mytilaster lineatus* (Gmel.). – Logvinenko and Starobogatov: 311–312, figs 339a, b, pl. 5, figs 1, 2 [**non** Gmelin, 1791].
1969 *Mytilaster lineatus* (Gmelin, 1790). – Vekilov: 155–157, pl. 35, figs 1–25 [**non** Gmelin, 1791].
2013 *Mytilaster lineatus* (Gmelin, 1791). – Kijashko in Bogutskaya et al.: 316, fig. 104 [**non** Gmelin, 1791].

Status. Native to Black Sea Basin, invasive in Caspian Sea, introduced in Aral Sea but extinct there.

Type locality. Sicily, Italy.

Distribution. Native to the Mediterranean and Black Sea. Introduced in the Caspian Sea between 1917 and 1919 (Grigorovich et al. 2003).

Taxonomic notes. This species has commonly been mentioned as *Mytilaster lineatus* (Gmelin, 1791), but the Caspian-Aral species lacks the ribbing typical for that species. The attribution to *M. minimus* is based on shell morphology but confirmation from molecular analyses is required.

Remarks. *Mytilaster minimus* has successfully replaced *Dreissena caspia* and *D. elata* between 1938 and 1957 (Kostianoy and Kosarev 2005) in the Caspian Sea. Logvinenko and Starobogatov (1969) reported this species from the southern areas of the northern Caspian Sea, in the middle and the southern Caspian Sea down to 35–50 m water depth. Rarely, small individuals were found at depths down to 100 m. The species does not tolerate salinities below 7–8‰. This species was mentioned from depths between 200 and 600 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *M. lineatus*). These deep records are unusual given other records and will require confirmation.

Conservation status. Not assessed.

Family Cardiidae Lamarck, 1809

Remarks. For the genus *Cerastoderma*, the species status of Pontocaspian material is subject of debate where morphological and increasingly molecular arguments show the possibility of sibling species occurrences (Sromek et al. 2016). The genus *Didacna* is relatively well established, however much uncertainty exists over distinction between the genera *Monodacna*, *Adacna*, and *Hypanis*. The generic concepts have shifted through time. Only lately, Kijashko in Bogutskaya et al. (2013) treated *Monodacna* as a subgenus of *Adacna*. Büyükmeriç and Wesselingh (2018) discussed the distinction between the three genera and considered *Monodacna*, *Adacna*, and *Hypanis* as valid.

Adacna laeviuscula (Eichwald, 1829)

*1829 *G.*[*lycymeris*] *laeviuscula* Eichwald: 279, pl. 5, fig. 1a, b.
1838 *Adacna Laeviuscula* m. – Eichwald: 170–171.
1841 *Adacna laeviuscula*. – Eichwald: 281–282, pl. 39, fig. 1a–d.

1905 *Adacna laeviuscula* (Eichwald, 1829). – Ostroumov: pl. 2, fig. E.
1907 *Adacna laeviuscula*. – Ostroumov: 25, text fig., pl. 4, figs 6–8.
1952 *Adacna* (*Adacna*) *laeviuscula* (Eichwald, 1829). – Zhadin: 353–354, pl. 9, fig. 331.
1958 *Adacna* (*Adacna*) *laeviuscula* (Eichwald), 1829. – Nevesskaja: 49–50, pl. 9, figs 15–18.
1969 *Hypanis laeviuscula laeviuscula* (Eichw.). – Logvinenko and Starobogatov: 337, fig. 353(5).
1973 *Hypanis laeviuscula laeviuscula* Eichwald, 1829. – Grossu: 144–145, text fig. 29.
2013 *Adacna laeviuscula* (Eichwald, 1829). – Kijashko in Bogutskaya et al.: 377, fig. 154, photo 48.
2016 *Adacna* (*Adacna*) *laeviuscula* (Eichwald, 1829). – Vinarski and Kantor: 64.

Status. Pontocaspian species, endemic to Caspian Sea and possibly Black Sea Basin.

Type locality. Azerbaijan, Caspian Sea, Gulf of Baku is the type locality given by Vinarski and Kantor (2016) and this is written on the label of the type material. However, the type description reads "Hab. australem ripam maris caspii, in sinu Astrabadensi" [southern border of the Caspian Sea, in bight of Astrabad (= Gorgan, Iran)]. Further research on the labels and documentation is required to assess whether a new lectotype or even neotype must be assigned for *Adacna laeviuscula*.

Distribution. Caspian Sea; limans, coastal lakes, and Danube Delta in Black Sea Basin (in case *A. fragilis* will be shown to be a synonym of *A. laeviuscula*).

Taxonomic notes. See discussion under *A. fragilis*.

Remarks. Kijashko in Bogutskaya et al. (2013) list the presence of this species at 30–60 m water depth in the Caspian Sea from muddy, sandy-mud, and rarely sandy bottoms. Logvinenko and Starobogatov (1969) reported the species from the northern, middle, and southern Caspian Sea basins down to 80–85 m water depth. In the Caspian Sea, the species has not been found in areas with salinities below 4‰. However, the common occurrence of fresh (paired) specimens on beaches seen at Turali (Dagestan, Russia) and northern Azerbaijan indicates this species maintains viable populations in foreshore and possibly even shoreface habitats.

Conservation status. Not assessed.

Adacna fragilis Milaschewitsch, 1908

*1908 *Adacna fragilis* Milaschewitch: 992–993.
1973 *Hypanis laeviuscula fragilis* Milaschevitsch, 1916. – Grossu: 145.
?2006b *Hypanis* (*Adacna*) *laeviuscula fragilis* (Milachevitch, 1908). – Munasypova-Motyash: 522.
2009 *Adacna (Adacna) fragilis* Milaschevich, 1908. – Popa et al.: 13, fig. 5.
2016 *Adacna* (*Adacna*) *fragilis* Milaschewitsch, 1908. – Vinarski and Kantor: 64.

Status. Pontocaspian species, Black Sea Basin, status uncertain.

Type locality. Odessa region, Dniester liman and Katlabhuk Lake (Ukraine: Vinarski and Kantor 2016).

Distribution. Danube Delta region and NW Black Sea Basin coastal areas of Ukraine.

Taxonomic notes. We are uncertain about the status of *Adacna fragilis* Milaschewitch, 1908. The Black Sea Basin material has a wide variety of shapes and often is thinner and sometimes more elliptical than the Caspian *A. laeviuscula*. Both forms were synonymised by Graf and Cummings (2018) and indicated as a possible synonym in MolluscaBase (2018b). However, the Black Sea Basin occurrences are recorded from (coastal) lakes and small rivers suggesting little or only partial overlap in the ecological (and especially salinity) preferences of *A. laeviuscula* (e.g., Munasypova-Motyash 2006a, b, Popa et al. 2009). We are uncertain if *A. fragilis* might constitute a geographical subspecies (a status advocated by Grossu 1973), and further molecular analyses are needed to clarify the status of the Black Sea taxon.

Remarks. The species has been reported alive by Popa et al. (2009) from the Razim Lake complex on the Romanian Black Sea coast.

Conservation status. Not assessed.

Adacna minima Ostroumov, 1907

*1907 *Adacna minima* Ostroumov: 23, text fig., pl. 4, figs 1–5.
1952 *Adacna* (*Adacna*) *vitrea* var. *minima* (Ostroumoff, 1907). – Zhadin: 353.
1967 *Hypanis minima ostroumovi* Logvinenko and Starobogatov: 233.
1969 *Hypanis minima ostroumovi* Logv. et Star. – Logvinenko and Starobogatov: 338, fig. 354(3).
1973 *Hypanis minima ostroumovi* Logvinenko et Starobogatov, 1968. – Grossu: 146, text fig. 31.
?1974 *Hypanis minima sidorovi* Starobogatov: 246, fig. 213.
2003 *Hypanis minima minima* (Ostroumov, 1907). – Andreeva and Andreev: 88, fig. 5.1(3, 4).
?2009 *Hypania* [sic] *minima* (Ostroumoff, 1907). – Filippov and Riedel: 75, fig. 4s, t.
2013 *Adacna minima ostroumovi* (Logvinenko et Starobogatov, 1967). – Kijashko in Bogutskaya et al.: 378, fig. 146.
2016 *Adacna* (*Adacna*) *minima minima* (Ostroumov, 1907). – Vinarski and Kantor: 64.
2016 *Adacna* (*Adacna*) *minima ostroumovi* Logvinenko et Starobogatov, 1967. – Vinarski and Kantor: 64.

Status. Pontocaspian species, endemic to Caspian Sea and Aral Sea; likely disappeared from the latter.

Type locality. The northern Caspian Sea and the Aral Sea (Vinarski and Kantor 2016).

Distribution. Aral Sea (probably extinct there; Andreeva and Andreev 2003), Caspian Sea.

Taxonomic notes. Graf and Cummings (2018) consider this species as a synonym of *A. vitrea*, but Kijashko in Bogutskaya et al. (2013) regards it as a valid species. The latter considers *A. minima minima* from the Aral Sea and *A. minima ostroumovi* syn. n. from the Caspian Sea as distinct geographical subspecies. The likely disappear-

ance of the species from the Aral Sea makes a molecular assessment of their distinctness very difficult and given the lack of other arguments we synonymise both. Furthermore, we are uncertain about the status of the subspecies *Hypanis minima sidorovi* Starobogatov, 1974 from the western Aral Sea. Without further data we assume it concerns a form that falls within the wide morphological variation of *A. minima*. We moreover are very uncertain as to the status of *Hypanis minima* from Holocene deposits of Aral Sea as illustrated by Filippov and Riedel (2009, fig. 4s, t). The juvenile specimen has relatively strong cardinal teeth, onset of clear ribs, and a general shape that more resembles *Monodacna caspia*.

Remarks. The species has been recorded mostly from the middle and southern Caspian Sea and more rarely from the eastern areas in the northern Caspian Sea down to 35 m water depth (Logvinenko and Starobogatov 1969) as well as from the Aral Sea from where it may have disappeared.

Conservation status. Not assessed.

Adacna vitrea (Eichwald, 1829)

*1829 *G.*[*lycymeris*] *vitrea* Eichwald: 279, pl. 5, fig. 3.
1838 *Adacna vitrea* m. – Eichwald: 172–173.
1841 *Adacna vitrea*. – Eichwald: 282–283, pl. 39, fig. 2a, b.
1905 *Adacna glabra* Ostroumov: 18–19.
1932a *Adacna vitrea* (Eichwald, 1829). – Bogachev: pl. 1, figs 3, 4, 11.
1932b *Adacna vitrea* (Eichwald, 1829). – Bogachev: 33, pl. 3, figs 13–16, 28–29.
1952 *Adacna* (*Adacna*) *vitrea* (Eichwald, 1829). – Zhadin: 352–353, fig. 330.
1958 *Adacna* (*Adacna*) *vitrea* (Eichwald), 1838. – Nevesskaja: 47–48, pl. 9, figs 19–22.
1969 *Hypanis vitrea vitrea* (Eichw.). – Logvinenko and Starobogatov: 337, fig. 354(1), pl. 5, fig. 11.
1969 *Hypanis vitrea glabra* (Ostr.). – Logvinenko and Starobogatov: 338, fig. 354(2).
1973 *Hypanis vitrea vitrea* Eichwald, 1829. – Grossu: 145–146, text fig. 30A.
1973 *Hypanis vitrea glabra* Ostroumoff, 1905. – Grossu: 146, text fig. 30B.
2003 *Hypanis vitrea bergi* Starobogatov, 1974. – Andreeva and Andreev: 86, fig. 5.1(1, 2).
2013 *Adacna* (*Adacna*) *vitrea vitrea* (Eichwald, 1829). – Kijashko in Bogutskaya et al.: 378, fig. 148.
2013 *Adacna* (*Adacna*) *vitrea glabra* Ostroumoff, 1905. – Kijashko in Bogutskaya et al.: 379, fig. 149.
2016 *Adacna* (*Adacna*) *vitrea vitrea* (Eichwald, 1829). – Vinarski and Kantor: 65.
2016 *Adacna* (*Adacna*) *vitrea glabra* Ostroumov, 1905. – Vinarski and Kantor: 65.
2016 *Adacna* (*Adacna*) *vitrea bergi* (Starobogatov, 1974). – Vinarski and Kantor: 65.

Status. Pontocaspian species, endemic to Caspian Sea Basin, Black Sea Basin, and Aral Sea Basin.

Type locality. "Australem oram caspii maris, Astrabadensem" [southern coast of Caspian Sea, near Astrabad (= Gorgan, Iran)].

Distribution. Black Sea Basin (also in Azov Sea and adjacent lower Don River), Caspian Sea Basin, and Aral Sea (including delta of Amu-Darya River). The Aral populations may have gone extinct in the 1980s (Andreeva and Andreev 2003).

Taxonomic notes. The species has been subdivided into three geographical subspecies which were not recognised by Graf and Cummings (2018). It concerns a species with thin shells that yield very few diagnostic characters that show overlap. Here, we synonymise the subspecies pending molecular assessments of their status.

Conservation status. Not assessed.

Cerastoderma glaucum (Bruguière, 1789) s.l.

*1789 *Cardium glaucum* Bruguière: 221–222.
1789 *Cardium Glaucum* Poiret: 13–15.
1869 *Cardium isthmicus* Issel: 74–76.
1952 *Cardium edule* L., 1758. – Zhadin: 344–345, fig. 318 [**non** *Cardium edule* Linnaeus, 1758].
2003 *Cerastoderma isthmicum* (Issel, 1869). – Andreeva & Andreev: 54, 62, figs 6.1(b), 6.7.
2013 *Cerastoderma glaucum* (Poiret, 1789). – Kijashko in Bogutskaya et al.: 342, fig. 126, photo 39.
2016 *Cerastoderma glaucum* (Bruguière, 1789). – Vinarski and Kantor: 69.
2016 *Cerastoderma isthmicus* (Issel, 1869). – Vinarski and Kantor: 70.

Status. Native Pontocaspian species (Black Sea Basin), Holocene invasive in Caspian Sea and Aral Sea.

Type locality. French Mediterranean.

Distribution. NE Atlantic, Baltic Sea, Mediterranean, Black Sea Basin, Caspian Sea Basin, Aral Sea, isolated Saharan lakes (Plaziat 1991).

Taxonomic notes. DNA studies have shown a strong structuring between Atlantic–western Mediterranean, Ionian, and Aegean-Pontocaspian populations of *C. glaucum* (Nikula and Väinölä 2003, Sromek et al. 2016). According to Sromek et al. (2016: 515), the "strong genetic differentiation and the occurrence of private alleles may hint at the presence of cryptic species within *C. glaucum*". For a discussion on the authority of *C. glaucum*, see Vinarski and Kantor (2016: 69–70).

Remarks. The arrival of *Cerastoderma glaucum* in the Caspian Sea circa 8000 years ago has been linked to human settlement expansion through the Manych corridor (Fedorov 1957, Yanina 2009). It would be among the earliest human-mediated dispersal events for invertebrate species known to date.

Conservation status. Not assessed.

Cerastoderma sp. A [non *C. rhomboides* (Lamarck, 1819)]

1916 *Cardium edule* var. *nuciformis* Milaschewitch: 257–259, pl. 7, figs 7, 8 [**non** *Cardium nuciforme* d'Orbigny, 1850].

2003 *Cerastoderma rhomboides rhomboides* (Lamarck, 1819). – Andreeva and Andreev: 93, fig. 6.1(A) [**non** *Cardium rhomboides* Lamarck, 1819].
2013 *Cerastoderma rhomboides* (Lamarck, 1819). – Kijashko in Bogutskaya et al.: 343, fig. 127, photo 40 [**non** Lamarck, 1819].
2016 *Cerastoderma rhomboides* (Lamarck, 1819). – Vinarski and Kantor: 70 [**non** Lamarck, 1819].

Status. Native Pontocaspian species (Black Sea Basin), introduced to Caspian Sea and Aral Sea.

Distribution. Black Sea (including Sea of Azov), Caspian Sea, Aral Sea, Aegean.

Taxonomic notes. This concerns a common rhomboid-shaped species in the Pontocaspian region whose name is uncertain. It has a short ligament in common with *C. glaucum* and the persistent occurrence of ribs on the posterior margin, the well-defined character of the ribs and the regular occurrence of scales in common with western European *C. edule*. This form has been often referred to as *C. rhomboides* (Lamarck, 1819) that has been described from the Italian Pliocene but that concerns a typical *glaucum* form (Fig. 2), not the rhomboid form of the Pontocaspian *Cerastoderma*. The species has been named *Cardium edule* var. *nuciformis* by Milaschewitch (1916), but that name is a junior primary homonym of *Cardium nuciforme* d'Orbigny, 1850. Even though some morphological features mentioned in the description of *C. lamarcki* (Reeve, 1845) may resemble those of the Pontocaspian species, the former has been traced to southern Great Britain from where molecular analyses only show the presence of *C. glaucum* (Nikula and Väinölä 2003).

Conservation status. Not assessed.

Figure 2. Syntype of *Cerastoderma rhomboides* (Lamarck, 1819), stored in the Muséum national d'Histoire naturelle Paris (MNHN.F.A50142), Pliocene, Tuscany, Italy. Photograph by E Porez. https://science.mnhn.fr/institution/mnhn/collection/f/item/a50142?lang=fr_FR

***Didacna baeri* (Grimm, 1877)**
Fig. 3a

*1877 *Cardium Baeri* Grimm: 51–54, pl. 8, figs 2, 3.
1914 *Didacna Baeri* (Grimm, 1877). – Nalivkin & Anisimov: 4, pl. 1, figs 4, 5.
1932 *Didacna Baeri* (Grimm, 1877). – Bogachev: 29, pl. 3, figs 1–7.
1933 *Didacna Baeri* (Grimm, 1877). – Zhizhchenko: 34, pl. 2, figs 5–8.
1952 *Didacna baeri* (Grimm, 1877). – Zhadin: 347–348, figs 321, 322.
1953 *Didacna baeri* (Grimm, 1877). – Fedorov: 129, pl. 20, figs 10, 11.
1968 *Didacna baeri* (Grimm, 1877). – Gadzhiev: 76–77, pl. 1, figs 1, 2.
1969 *Didacna baeri* (Grimm). – Logvinenko & Starobogatov: 324, fig. 344(2).
1969 *Didacna baeri* (Grimm, 1877). – Vekilov: 139–144, pl. 25, figs 1–8.
1973 *Didacna baeri* Grimm, 1877. – Grossu: 131, text fig. 7.
1983 *Didacna baeri* (Grimm, 1877). – Popov: 180, pl. 16, figs 20–23.
1988 *Didacna baeri* (Grimm, 1877). – Yanina & Svitoch: 129, pl. 3, figs 7–13.
2005 *Didacna baeri* (Grimm, 1877). – Yanina: 242–244, pl. 14, figs 12–15.
2007 *Didacna baeri* (Grimm, 1877). – Nevesskaja: 940–941, pl. 23, figs 11–17.
2013 *Didacna baeri* (Grimm, 1877). – Kijashko in Bogutskaya et al.: 352, fig. 136, photo 41 [pars, excluding synonymy of *Didacna crassa*].
2016 *Didacna baeri* (Grimm, 1877). – Vinarski & Kantor: 71 [pars, excluding synonymy of *Didacna crassa*].

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Caspian Sea, offshore Turkmenistan, station 132, 40°32'N, 52°23'E.

Distribution. Logvinenko and Starobogatov (1969) reported *Didacna baeri* from the southern basin (mostly on the eastern side) and from the middle basin down to 60 m water depth.

Taxonomic notes. In recent works (e.g., Kijashko in Bogutskaya et al. 2013), the species *Didacna crassa* (Eichwald, 1829) [= *D. eichwaldi* (Krynicki, 1837)] has been considered a synonym of *D. baeri*. However, both species can be distinguished. *Didacna baeri* has a less extended, more roundish shell, a less developed keel, and a low top with less projecting beak and in general more ribs than *D. eichwaldi* (Fig. 3). *Didacna baeri* occurred for the first time in the Novocaspian transgressive deposits whereas *D. crassa* already occurred in the late Khvalynian (Late Pleistocene). Both became very common during the Novocaspian.

Conservation status. Not assessed.

***Didacna barbotdemarnii* (Grimm, 1877)**

*1877 *Cardium Barbot-de-Marnii* Grimm: 56–58, pl. 8, figs 5, 6.
1952 *Didacna barbot-de-marnyi* [sic] (Grimm, 1877). – Zhadin: 348, fig. 323.
1969 *Didacna barbotdemarnyi* [sic] (Grimm). – Logvinenko and Starobogatov: 326–327, fig. 346, pl. 5, fig. 8.

1973 *Didacna barbotdemarnyi* [sic] Grimm, 1877. – Grossu: 133, text fig. 10.
2007 *Didacna barbotdemarnyi* [sic] (Grimm, 1877). – Nevesskaja: 941–943, pl. 24, figs 10–14.
2013 *Didacna barbotdemarnii* (Grimm, 1877). – Kijashko in Bogutskaya et al.: 353, fig. 139, photo 42.
2016 *Didacna barbotdemarnii* (Grimm, 1877). – Vinarski and Kantor: 71.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Caspian Sea, station 116, 44°17'N, 50°22'E.

Distribution. Southern, middle, and southern part of the northern Caspian Sea down to 40 m water depth, preferentially on sandy sediments (Logvinenko and Starobogatov 1969).

Conservation status. Not assessed.

***Didacna eichwaldi* (Krynicki, 1837)**
Fig. 3b

°1829 *C.*[*ardium*] *crassum* Eichwald: 283 [**non** *Cardium crassum* Gmelin, 1791].
*1837 *Cardium Eichwaldi* Krynicki: 61 [**nom. nov.** pro *C. crassum* Eichwald, 1829, **non** Gmelin, 1791].
1841 *Didacna crassa*. – Eichwald: 273, pl. 39, fig. 6a, b.
1876 *Cardium crassum* Eichwald, 1829. – Grimm: 136–138, pl. 6, fig. 3.
1905 *Didacna crassa* (Eichwald, 1829). – Ostroumov: 15, 69, pl. 2(A).
1932 *Didacna* aff. *crassa* (Eichwald, 1829). – Bogachev: 27, pl. 2, figs 11–14.
1952 *Didacna crassa* Eichwald, 1841. – Zhadin: 349, fig. 325.
1953 *Didacna crassa* (Eichwald, 1829). – Fedorov: 130, pl. 20, figs 8, 9, 12, 13.
1958 *Didacna crassa crassa* Eichwald, 1829. – Nevesskaja: 39–40, pl. 7, figs 8, 9.
1969 *Didacna crassa* (Eichwald, 1829). – Vekilov: 134–139, pl. 24, figs 1–6, pl. 27, figs 1, 2.
1988 *Didacna crassa crassa* (Eichwald, 1829). – Yanina and Svitoch: pl. 12, figs 8, 9, pl. 13, figs 1–5.
2005 *Didacna crassa* (Eichwald, 1829). – Yanina: 242, pl. 14, figs 3–6.
2007 *Didacna crassa* (Eichwald, 1829). – Nevesskaja: 939–940, pl. 23, figs 1–5.
2013 *Didacna baeri* (Grimm, 1877). – Kijashko in Bogutskaya et al.: 352 [pars, non fig. 136, photo 41, **non** *Cardium baeri* Grimm, 1877].
2016 *Didacna baeri* (Grimm, 1877). – Vinarski and Kantor: 71 [pars, **non** Grimm, 1877].

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. "Caspium mare" (Caspian Sea) (for *C. crassum* Eichwald, 1829).

Distribution. Caspian Sea. *Didacna eichwaldi* is known from the middle and southern Caspian Sea basins down to 35 m water depth and cannot tolerate lowered salinities.

Figure 3. *Didacna baeri* versus *D. eichwaldi* from Holocene (Novocaspian) deposits of Turali Lagoon (Dagestan, Russia). **a** RGM.961899, *Didacna baeri* (Grimm, 1877) **b** RGM.961900, *Didacna eichwaldi* (Krynicki, 1837), same locality. Scale bar: 1 cm.

Taxonomic notes. In recent works (Kijashko in Bogutskaya et al. 2013), the species *Didacna crassa* (Eichwald, 1829) [= *D. eichwaldi* (Krynicki, 1837)] has been considered a synonym of *D. baeri*. However, we see morphological discontinuities in our extensive material from the northern Caspian Sea Basin that implies that *D. eichwaldi* with its protruding umbo and shouldered appearance is distinct from *D. baeri* that is characterised by a rounded umbo (see discussion above under *D. baeri*). Despite being in common usage, the name *Didacna crassa* is invalid as it is a junior homonym of *Cardium crassum* Gmelin, 1791; Krynicki (1837) introduced *Cardium eichwaldi* as replacement name.

Conservation status. Not assessed.

Didacna longipes (Grimm, 1877)

*1877 *Cardium longipes* Grimm: 54–56, pl. 8, fig. 4a–c.
1952 *Didacna longipes* (Grimm, 1877). – Zhadin: 349–350, fig. 326.
1969 *Didacna longipes* (Grimm). – Logvinenko and Starobogatov: 326, fig. 345.

1973 *Didacna longipes* Grimm, 1877. – Grossu: 132, text fig. 9, pl. 1, fig. 2.
?2007 *Didacna carinata* Nevesskaja: 943, pl. 24, figs 15–19.
2013 *Didacna longipes* (Grimm, 1877). – Kijashko in Bogutskaya et al.: 354, fig. 137, photo 43.
2016 *Didacna longipes* (Grimm, 1877). – Vinarski and Kantor: 71.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Caspian Sea, offshore Azerbaijan, approximately 40°39'N, 50°26'E.

Distribution. Southern and middle Caspian Sea basins and southern part of the northern Caspian Sea down to 30–40 m water depth. The species often co-occurs with *D. barbotdemarnii*.

Remarks. We are uncertain about the status of *Didacna carinata* Nevesskaja, 2007. The overall outline resembles that of *D. barbotdemarnii*, but the former species appears smaller and thinner. Kijashko in Bogutskaya et al. (2013) considered *D. carinata* as a synonym of *D. longipes*.

Conservation status. Not assessed.

Didacna parallela Bogachev, 1932

*1932a *Didacna parallela* Bogachev: pl. 2, figs 2, 3.
1932b *Didacna parallela* Bogachev: 44, pl. 5, figs 1–7, 9.
1953 *Didacna parallella* [sic] Bogatchev, 1932. – Fedorov: 126, pl. 17, figs 1–11.
1969 *Didacna parallella* [sic] Bog. – Logvinenko and Starobogatov: 324–325, fig. 344(3).
1969 *Didacna parallella* [sic] Bogatchev, 1932. – Vekilov: 117–120, pl. 21, figs 1–8.
1973 *Didacna parallella* [sic] Bogatchev, 1922 [sic]. – Grossu: 131, text fig. 8, pl. 1, fig. 4.
2005 *Didacna parallella* [sic] Bogatchev, 1932. – Yanina: 237–238, pl. 12, figs 1–8.
2007 *Didacna parallella* [sic] Bogatchev, 1932. – Nevesskaja: 933–935, pl. 21, figs 1–5.
2013 *Didacna parallela* Bogachev, 1932. – Kijashko in Bogutskaya et al.: 355–356, fig. 138.
2016 *Didacna parallela* Bogachev, 1932. – Vinarski and Kantor: 72.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Khala, Apsheron Peninsula, Azerbaijan (early Khvalynian, Late Pleistocene).

Distribution. Caspian Sea, southern basin and western part of middle basin between 50–85 m water depth (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017), but we are not certain whether it concerns living specimens.

Remarks. *Didacna parallela* has been considered as extinct by Nevesskaja (2007) but was nevertheless treated in Kijashko in Bogutskaya et al. (2013). Live records are known at least until 1986 and we have no particular reason to assume it is extinct.

Conservation status. Not assessed.

Didacna praetrigonoides Nalivkin & Anisimov, 1914

*1914 *Didacna praetrigonoides* Nalivkin & Anisimov: 5–6, 16–17, pl. 1, figs 1, 2.
1932a *Didacna praetrigonoides* Nalivkin & Anisimov, 1914. – Bogachev: pl. 2, fig. 1.
1932b *Didacna praetrigonoides* Nalivkin & Anisimov, 1914. – Bogachev: 42, pl. 4, figs 1–8, pl. 5, fig. 8.
1948 *Didacna praetrigonoides* Nal. – Fedorov: pl. 2, figs 10–13.
1953 *Didacna praetrigonoides* Nalivkin & Anisimov, 1914. – Fedorov: 128, pl. 18, figs 1–6, pl. 19, figs 1–6.
1958 *Didacna praetrigonoides* Nalivkin & Anisimov, 1914. – Nevesskaja: 17–20, pl. 1, figs 1–14.
1969 *Didacna trigonoides praetrigonoides* Nal. & Anis. – Logvinenko and Starobogatov: 324, fig. 343(2).
1969 *Didacna praetrigonoides* Nalivkin & Anisimov, 1914. – Vekilov: 120–128, pl. 22, figs 1–9.
1973 *Didacna trigonoides praetrigonoides* Nalivkin & Anisimov, 1915. – Grossu: 129, text fig. 5.
1983 *Didacna praetrigonoides praetrigonoides* Nalivkin & Anisimov, 1914. – Popov: 195, pl. 15, figs 1, 2.
1988 *Didacna praetrigonoides* Nalivkin & Anisimov, 1914. – Yanina and Svitoch: pl. 8, figs 4–7.
2005 *Didacna praetrigonoides* Nalivkin & Anisimov, 1914. – Yanina: 241, pl. 14, figs 1, 2.
2007 *Didacna praetrigonoides praetrigonoides* Nalivkin & Anisimov, 1914. – Nevesskaja: 927, pl. 19, figs 9, 10.

Status. Pontocaspian species, endemic to Caspian Sea. Possibly extinct.

Type locality. Apsheron Peninsula, Azerbaijan, Quaternary.

Distribution. Caspian Sea. Logvinenko and Starobogatov (1969) reported the species from the southern Caspian Sea Basin and the southern part of the middle Caspian Sea Basin down to 60 m water depth. The species has been collected from Holocene deposits and beach occurrences the western part of the middle Caspian Sea Basin as well (FW, pers. obs.). The species is reportedly extinct, not mentioned in Kijashko in Bogutskaya et al. (2013).

Remarks. The first appearance of *Didacna praetrigonoides* is in lower Khvalynian deposits, it became widespread during the late Khvalynian and was rare during the Novocaspian.

Conservation status. Not assessed. *Didacna praetrigonoides* has been reported to occur 'rarely in the modern Caspian Sea' (Nevesskaja 2007: 927), but material from recent assemblages has not been found.

Didacna profundicola Logvinenko & Starobogatov, 1966

*1966a *Didacna profundicola* Logvinenko & Starobogatov: 13–14, fig. 1.
1969 *Didacna profundicola* Logv. & Star. – Logvinenko and Starobogatov: 328–329, fig. 349.

1973 *Didacna profundicola* Logvinenko & Starobogatov, 1966. – Grossu: 134, text fig. 13.
2007 *Didacna profundicola* Logvinenko & Starobogatov, 1966. – Nevesskaja: 944, pl. 20, fig. 28a–c.
2013 *Didacna profundicola* Logvinenko & Starobogatov. – Kijashko in Bogutskaya et al.: 356, fig. 140, photo 45.
2016 *Didacna profundicola* Logvinenko & Starobogatov. – Vinarski and Kantor: 72.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Central part of the Caspian Sea, 39°38'N, 52°02'E(offshore Turkmenistan).

Distribution. Middle and southern basins of Caspian Sea between 75 and 409 m water depth (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 600 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Conservation status. Not assessed.

Didacna protracta (Eichwald, 1841)

*1841 *Adacna protracta* Eichwald: 280, pl. 40, figs 10, 11 [non figs 9, 10 as indicated in the text].
1877 *Cardium catillus* Eichw. – Grimm: 58, pl. 8, figs 7, 8 [**non** *Monodacna catillus* Eichwald, 1841].
1910 *Didacna protracta* (Eichwald, 1841). – Andrusov: 67, pl. 8, figs 22, 33, pl. 9, figs 1–9.
1952 *Didacna protracta* (Eichwald, 1841). – Zhadin: 348–349, fig. 324.
1953 *Didacna protracta* (Eichwald, 1829). – Fedorov: 127, pl. 14, figs 12–15, pl. 15, figs 1–16.
1967 *Didacna protracta* Eichwald, 1841. – Svitoch: 42–43, pl. 6, figs 6–9, pl. 7, figs 1, 2.
1969 *Didacna protracta protracta* (Eichw.). – Logvinenko and Starobogatov: 327, fig. 347.
1973 *Didacna protracta protracta* Eichwald, 1841. – Grossu: 133, text fig. 11.
1973 *Didacna protracta submedia* Andrusov, 1911. – Grossu: 133–134, text fig. 12.
1999 *Didacna protracta* (Eichwald, 1829). – Fedorov: pl. 12, figs 4–7.
2005 *Didacna protracta* (Eichwald, 1829). – Yanina: 238–239, pl. 12, figs 9–19.
2007 *Didacna protracta protracta* (Eichwald, 1829). – Nevesskaja: 938–939, pl. 22, figs 4–13.
2013 *Didacna protracta* (Eichwald, 1829). – Kijashko in Bogutskaya et al.: 356, fig. 141.
2013 *Didacna protracta submedia* Andrusov, 1910. – Kijashko in Bogutskaya et al.: 356, fig. 142.
2016 *Didacna protracta* (Eichwald, 1841). – Vinarski and Kantor: 72.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. The type series (?Recent, Caspian Sea) was reported as lost by Nevesskaja (2007) who introduced a neotype from the Elton Lake surroundings in the northern Caspian plains, Russia (early Khvalynian, Late Pleistocene).

Distribution. Middle and southern Caspian Sea basins; it is most common in the middle basin at 25–85 m water depth (Logvinenko and Starobogatov 1969).

Taxonomic notes. According to Logvinenko and Starobogatov (1969), two subspecies occur in the Caspian Sea at different depth ranges: *D. protracta protracta* at 25–50 m and *D. protracta submedia* Andrusov, 1910 at 50–85 m. The latter differs from *D. p. protracta* by the relative posterior location of the umbo that is furthermore subdued. Both forms of *Didacna protracta* are widespread in the Khvalynian deposits of the Caspian Sea and Manych depression. According to Kijashko in Bogutskaya et al. (2013) morphological differences characteristic for the subspecies of *Didacna protracta* are due to allometric growth. The mere difference in depth distribution, with overlapping depths and intermediate forms, does not provide any argument to maintain these subspecies. *Didacna protracta* is the type species of the subgenus *Protodidacna* Logvinenko & Starobogatov, 1966.

Remarks. The authorship attribution of this species to Eichwald (1829) as proposed by several authors was rejected in Vinarski and Kantor (2016). According to them, *Cardium protractum* Eichwald, 1829, described from the western Ukraine, probably refers to a different species.

Conservation status. Not assessed.

Didacna pyramidata (Grimm, 1877)

*1877 *Cardium pyramidatum* Grimm: 46–49, pl. 8, fig. 1a–d.
1932 *Didacna pyramidata* (Grimm, 1877). – Bogachev: 28–29, pl. 2, figs 15, 16.
1952 *Didacna pyramidata* (Grimm, 1877). – Zhadin: 347, fig. 320.
1969 *Didacna pyramidata* (Grimm). – Logvinenko and Starobogatov: 324, fig. 344(1).
1969 *Didacna pyramidata* (Grimm, 1877). – Vekilov: 144–147, pl. 26, figs 1–5.
1973 *Didacna pyramidata* Grimm, 1877. – Grossu: 130, text fig. 6, pl. 1, fig. 1.
2007 *Didacna pyramidata* (Grimm, 1877). – Nevesskaja: 940, pl. 23, figs 6–10.
2013 *Didacna pyramidata* (Grimm, 1877). – Kijashko in Bogutskaya et al.: 357, fig. 135, photo 47.
2016 *Didacna pyramidata* (Grimm, 1877). – Vinarski and Kantor: 73.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Caspian Sea, offshore Azerbaijan, 39°47'N, 49°59'30"E (Kijashko in Bogutskaya et al. 2013).

Distribution. Caspian Sea: southern basin and southern part of the middle basin at depths between 30–100 m (Logvinenko and Starobogatov 1969).

Conservation status. Not assessed.

Didacna trigonoides (Pallas, 1771)

*1771 *Cardium trigonoides* Pallas: 478.
1831 *Cardium trigonoides* (Pallas, 1771). – Eichwald: 282.

1838 *Didacna trigonoides* n. – Eichwald: 166–167.
1841 *Didacna trigonoides*. – Eichwald: 271–272, pl. 39, fig. 5a–c.
1876 *Cardium trigonoides*, Pall. – Grimm: 138–140, pl. 6, fig. 2.
1914 *Didacna trigonoides* (Pallas, 1771). – Kalitskiy: pl. 3, figs 1, 2.
1914 *Didacna trigonoides* (Pallas, 1771). – Nalivkin and Anisimov: 6, pl. 1, fig. 3.
1932a *Didacna trigonoides* (Pallas, 1771). – Bogachev: pl. 1, figs 5, 6.
1932b *Didacna trigonoides* (Pallas, 1771). – Bogachev: 25, pl. 2, figs 1–9.
1933 *Didacna trigonoides* (Pallas, 1771). – Zhizhchenko: 35–36, pl. 2, figs 9, 10.
1950 *Didacna trigonoides* (Pallas, 1771). – Pravoslavlev: 21–22, figs 1–4.
1952 *Didacna trigonoides* (Pallas, 1771). – Zhadin: 346, fig. 319.
1953 *Didacna trigonoides* (Pallas, 1771). – Fedorov: 129, pl. 20, figs 7–9.
1969 *Didacna trigonoides trigonoides* (Pall.). – Logvinenko and Starobogatov: 323, fig. 343(1), pl. 5, fig. 7.
1969 *Didacna trigonoides* (Pallas, 1771). – Vekilov: 128–134, pl. 23, figs 1–9, pl. 27, fig. 6.
1973 *Didacna trigonoides trigonoides* Pallas, 1771. – Grossu: 129, text fig. 4, pl. 1, fig. 3.
1977 *Didacna trigonoides tuzetae* Tadjalli-Pour: 97, pl. 1, fig. 3.
1983 *Didacna trigonoides* (Pallas, 1771). – Popov: 204, pl. 16, fig. 19.
1986 *Didacna trigonoides* (Pallas, 1771). – Yakhimovich et al.: 79, pl. 10, fig. 1.
1988 *Didacna trigonoides* (Pallas, 1771). – Yanina and Svitoch: pl. 9, figs 7–12.
2005 *Didacna trigonoides* (Pallas, 1771). – Yanina: 244–245, pl. 14, figs 7–11.
2007 *Didacna trigonoides* (Pallas, 1771). – Nevesskaja: 941, pl. 24, figs 1–9.
2013 *Didacna trigonoides* (Pallas, 1771). – Kijashko in Bogutskaya et al.: 358, fig. 134.
2016 *Didacna trigonoides* (Pallas, 1771). – Vinarski and Kantor: 70.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Caspian Sea, a neotype has been designated based on a specimen from Chechen Island by Nevesskaja (2007, pl. 24, fig. 4).

Distribution. Caspian Sea, mostly eastern part of northern Caspian Sea Basin (Logvinenko and Starobogatov 1969). Furthermore found in living position in Novocaspian deposits near Turali, Dagestan (western part middle basin; FW).

Remark. Genetic data are available through Albrecht et al. (2014).

Conservation status. Not assessed.

Hypanis plicata (Eichwald, 1829)

*1829 *G.*[*lycymeris*] *plicata* Eichwald: 279, pl. 5, fig. 2a, b.
1838 *Adacne* [sic] *plicata* m. – Eichwald: 171–172.
1916 *Adacna relicta* Milaschewitch: 274–276, pl. 8, figs 10–13 [non figs 10–12 as indicated in the text].
1926 *Adacna relicta* var. *dolosmiana* Borcea: 468–469, pl. 18, figs 156–158, pl. 21, fig. 2.
1952 *Adacna* (*Hypanis*) *plicata* (Eichwald, 1829). – Zhadin: 354–355, fig. 332.
1958 *Adacna* (*Hypanis*) *plicata* (Eichwald), 1829. – Nevesskaja: 50–51, pl. 9, figs 9–14.
1969 *Hypanis plicata plicata* (Eichw.). – Logvinenko and Starobogatov: 331–332, fig. 350.

1973 *Hypanis plicata plicata* Eichwald, 1829. – Grossu: 136, text fig. 14, pl. 1, fig. 5.
1973 *Hypanis plicata relicta* Milaschevitsch, 1916. – Grossu: 136, text fig. 15, pl. 1, figs. 6, 20–23.
1973 *Hypanis dolosmaniana* [sic] Borcea, 1826. – Grossu: 136, text fig. 16, pl. 1, figs 16–19.
1977 *Hypanis plicata golbargae* Tadjalli-Pour: 99, pl. 1, fig. 5.
2006a *Hypanis plicata relicta* (Milachevitch, 1916). – Munasypova-Motyash: 45–46.
2009 *Adacna (Hypanis) plicata relicta* Milaschevich, 1916. – Popa et al. 12, fig. 4.
2013 *Hypanis plicata* (Eichwald, 1829). – Kijashko in Bogutskaya et al.: 387, fig. 164, photo 56.
2016 *Hypanis plicata plicata* (Eichwald, 1829). – Vinarski and Kantor: 73.
2016 *Hypanis plicata relicta* (Milaschewitsch, 1916). – Vinarski and Kantor: 74.

Status. Pontocaspian species, endemic to Caspian Sea Basin and Black Sea Basin.

Type locality. "Sinum Astrabadensem" [Caspian Sea near Astrabad (= Gorgan, Iran)].

Distribution. Caspian Sea, western liman coast Black Sea Basin.

Taxonomic notes. The Black Sea populations of *H. plicata* show a large range of morphological variation with elongated specimens that cannot be distinguished from Caspian *H. plicata* to severely stunted and irregularly shaped specimens that have been considered as a subspecies (*H. plicata relicta*) or as distinct species (*H. dolosmiana*) (e.g., Munasypova-Motyash 2006a). These forms have intermediates indicating that the Black Sea Basin specimens are a single species that should be attributed to *H. plicata* even though the latter appear to have lived under lower salinities than their Caspian counterparts. Molecular studies are required to elucidate the status of the Black Sea Basin material.

Conservation status. Not assessed. Fresh shells (including paired specimens) have been found at several beaches around the Caspian Sea (Turali, Dagestan, Russia; Şuraabad, Azerbaijan; FW). The species has been reported alive from the Razim lake complex of the Romanian Black Sea coast by Popa et al. (2009).

Monodacna acuticosta (Logvinenko & Starobogatov, 1967)

*1967 *Hypanis acuticosta* Logvinenko & Starobogatov: 232.
1969 *Hypanis angusticostata acuticosta* Logvinenko & Starobogatov: 334, fig. 353(1).
1973 *Hypanis angusticostata acuticosta* Logvinenko et Starobogatov, 1967. – Grossu: 141, fig. 23.
2013 *Adacna* (*Monodacna*) *acuticosta* (Logvinenko & Starobogatov, 1967). – Kijashko in Bogutskaya et al.: 379, fig. 160, photo 50.
2016 *Adacna* (*Monodacna*) *acuticosta* (Logvinenko & Starobogatov, 1967). – Vinarski and Kantor: 66.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. "Northern Caspian Sea on the central part of the slope" (Vinarski and Kantor 2016: 66), which likely refers to northern slope of the middle Caspian Sea Basin.

Distribution. Caspian Sea (middle Caspian Sea Basin).

Conservation status. Not assessed.

Monodacna albida (Logvinenko & Starobogatov, 1967)

*1967 *Hypanis albida* Logvinenko & Starobogatov: 232.
1969 *Hypanis albida* Logv. & Star. – Logvinenko and Starobogatov: 336, fig. 353(3).
1973 *Hypanis albida* Logvinenko & Starobogatov, 1967. – Grossu: 144, text fig. 28.
2013 *Adacna* (*Monodacna*) *albida* (Logvinenko & Starobogatov, 1967). – Kijashko in Bogutskaya et al.: 380, fig. 162, photo 51.
2016 *Adacna* (*Monodacna*) *albida* (Logvinenko & Starobogatov, 1967). – Vinarski and Kantor: 66.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. "Western Caspian Sea southeastwards from Derbent" (Vinarski and Kantor 2016: 66).

Distribution. Caspian Sea (middle and southern Caspian Sea Basin). This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Hypanis albida*).

Taxonomic notes. This species is part of a group of Caspian *Monodacna* with relative flat and wedge-shaped shells with low and sometimes poorly defined ribs (*M. albida, M. polymorpha*). Like for the *Monodacna caspia* group (see below), we are in need of studies to assess whether these taxa might form ecomorphs of a single species.

Conservation status. Not assessed.

Monodacna caspia (Eichwald, 1829)

*1829 *C.*[*orbula*] *caspia* Eichwald: 281, pl. 5, fig. 6a, b.
1841 *Monodacna caspia*. – Eichwald: 274, pl. 39, fig. 4a–c.
1905 *Monodacna caspia* (Eichwald, 1829). – Ostroumov: pl. 3, fig. C.
1932a *Monodacna caspia* (Eichwald, 1829). – Bogachev: pl. 1, figs 10, 13.
1932b *Monodacna caspia* (Eichwald, 1829). – Bogachev: 30, pl. 3, figs 21–27.
1952 *Monodacna edentula* (Pallas, 1771) var. *caspia* Eichwald, 1841. – Zhadin: 350, fig. 327B.
1958 *Monodacna caspia* (Eichwald), 1829. – Nevesskaja: 44–46, pl. 9, figs 1–8.
1963 *Monodacna caspia caspia* (Eichwald, 1829). – Nevesskaja: 66, pl. 8, figs 1–4.
1965 *Monodacna caspia caspia* (Eichwald). – Nevesskaja: 187–198, pl. 9, figs 6–15, 17–19, 23–26, 29.
1969 *Monodacna caspia* (Eichwald, 1829). – Vekilov: 147–150, pl. 31, figs 9–11.
1973 *Hypanis caspia caspia* Eichwald, 1829. – Grossu: 139, text fig. 19B.
1977 *Hypanis caspia assalae* Tadjalli-Pour: 99, pl. 1, fig. 4.
1977 *Hypanis caspia nahali* Tadjalli-Pour: 99, pl. 1, fig. 6.

2013 *Adacna* (*Monodacna*) *caspia caspia* (Eichwald, 1829). – Kijashko in Bogutskaya et al.: 380, fig. 154.
2016 *Adacna* (*Monodacna*) *caspia caspia* (Eichwald, 1829). – Vinarski and Kantor: 67.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. "Caspium mare" [Caspian Sea].

Distribution. Caspian Sea.

Taxonomic notes. The *Monodacna caspia* group (*M. caspia*, *M. filatovae*, and *M. knipowitschi*) comprises three (sub-) species that all share the relatively convex and rounded shell and well-defined ribbing. These species have been described from different areas and habitats in the Caspian Sea and have been morphologically characterised by Kijashko in Bogutskaya et al. (2013). However, neither morphological analyses of intermediate populations nor genetic analyses have been performed to clarify if the three taxa are distinct or ecomorphs of a single species. We are therefore uncertain whether *M. filatovae* and *M. knipowitschi* should be maintained.

Conservation status. Not assessed.

Monodacna colorata (Eichwald, 1829)

*1829 *G.*[*lycymeris*] *colorata* Eichwald: 279–280, pl. 5, fig. 4a, b.
1838 *Adacna colorata* m. – Eichwald: 169–170.
?1838 *Monodacna pontica* Eichwald: 168–169.
1926 *Monodacna colorata* var. *ialpugensis* Borcea: 452, pl. 15, fig. 16.
1926 *Monodacna colorata* var. *angusticostata* Borcea: 452–453, pl. 15, figs 27, 28, pl. 16, figs 90, 91, pl. 18, figs 143, 169, 173, pl. 21, fig. 7.
1926 *Adacna Luciae* Borcea: 469–471, pl. 18, figs 146, 148–149, 151–153, pl. 21, figs 8, 9.
1952 *Monodacna colorata* (Eichwald, 1829). – Zhadin: 351, fig. 328.
?1972 *Hypanis caspia grossui* Scarlato and Starobogatov: 214, pl. 4, fig. 1a, b.
1973 *Hypanis caspia grossui* Scarlato & Starobogatov, 1971. – Grossu: 140, text fig. 21, pl. 1, fig. 8.
1973 *Hypanis angusticostata angusticostata* Borcea, 1926. – Grossu: 141, pl. 1, fig. 12.
1973 *Hypanis luciae* Borcea, 1926. – Grossu: 138, text fig. 18.
1973 *Hypanis ialpugensis* Borcea, 1926. – Grossu: 142, fig. 24, pl. 1, figs 9, 10.
1973 *Hypanis colorata* Eichwald, 1829. – Grossu: 142–143, fig. 25, pl. 1, figs 13–15.
1973 *Hypanis pontica* Eichwald, 1838. – Grossu: 143, fig. 26, pl. 1, fig. 11.
2006a *Hypanis colorata* (Eichwald, 1829). – Munasypova-Motyash: 42–43.
?2006a *Hypanis pontica* (Eichwald, 1838). – Munasypova-Motyash: 43–44.
?2006a *Hypanis angusticostata angusticostata* (Borcea, 1926). – Munasypova-Motyash: 44.
2009 *Monodacna pontica* Eichwald, 1838. – Popa et al.: 10, text fig. 2.
2009 *Monodacna colorata* Eichwald, 1829. – Popa et al.: 10–11, text fig. 3.
2012 *Hypanis colorata* (Eichwald, 1829). – Popa et al.: 153, 154.
2012 *Hypanis angusticostata* (Borcea, 1926). – Popa et al.: 153, 154.

2013 *Adacna* (*Monodacna*) *colorata* (Eichwald, 1829). – Kijashko in Bogutskaya et al.: 383, fig. 158.
2016 *Adacna* (*Monodacna*) *angusticostata* (Borcea, 1926). – Vinarski and Kantor: 66.
2016 *Adacna* (*Monodacna*) *grossui* (Scarlato et Starobogatov, 1972). – Vinarski and Kantor: 67.
2016 *Adacna* (*Monodacna*) *ialpugensis* (Borcea, 1926). – Vinarski and Kantor: 68.

Status. Pontocaspian species, native to Black Sea Basin (including lower Danube River), invasive in Caspian Sea and Volga River.

Type locality. "Hypanin fluvium, ad nigrum usque mare" [Lower course of the Yuzhnyi Bug River, all the way to the Black Sea, Ukraine].

Distribution. Native to all Black Sea Basin Pontocaspian habitats and lower courses of adjacent rivers such as the Danube, Dnieper, and Dniester; invasive in Caspian Sea Basin and lower Volga, as well as Lake Balkhash (Kazakhstan). Occurs hundreds of kilometres upstream in major tributaries (Danube: Popa et al. 2009; recent observations in Volga River upstream Volgograd by MV and AFS).

Taxonomic notes. *Monodacna colorata* appears to be a morphologically very variable species. Here, we propose to synonymise several local Black Sea species with this taxon. Given the difficulty to distinguish relatively flat shells typically associated with *M. colorata* from the more convex shells typically associated with *M. pontica* in, e.g., Lake Razim (Romania) and the apparent lack of genetic differentiation of convex specimens from *M. colorata* we assume that *M. pontica* is a synonym of *M. colorata*. Shell differences have been attributed to substrate differences. Further investigations to confirm the synonymy are required. *Monodacna angusticostata* was synonymised by Popa et al. (2012) based on molecular evidence, even though some morphological distinction was reported from *M. colorata*, which they attributed to differential habitat preference (sediment type).

Conservation status. Not assessed.

Monodacna filatovae (Logvinenko & Starobogatov, 1967)

1876 *Cardium caspium*, Eichw. – Grimm: 134–136 [pars].
*1967 *Hypanis caspia filatovae* Logvinenko and Starobogatov: 231.
1973 *Hypanis caspia filatovae* Logvinenko & Starobogatov, 1967. – Grossu: 139, text fig. 19a.
2013 *Adacna* (*Monodacna*) *caspia filatovae* (Logvinenko & Starobogatov, 1967). – Kijashko in Bogutskaya et al.: 381, fig. 155, photo 52.
2016 *Adacna* (*Monodacna*) *caspia filatovae* (Logvinenko & Starobogatov, 1967). – Vinarski and Kantor: 67.

Status. Pontocaspian species, endemic to Caspian Sea. Uncertain whether it concerns a morph of *M. caspia*.

Type locality. Gulf of Baku, Caspian Sea, Azerbaijan.

Distribution. Southern Caspian Sea Basin.

Taxonomic notes. See remarks under *Monodacna caspia* above for uncertain status of *M. filatovae*.

Conservation status. Not assessed.

Monodacna knipowitschi (Logvinenko & Starobogatov, 1966)

*1966a *Hypanis caspia knipowitschi* Logvinenko & Starobogatov: 15, fig. 2.
1973 *Hypanis caspia knipowitschi* Logvinenko & Starobogatov, 1967. – Grossu: 140, text fig. 20.
2013 *Adacna* (*Monodacna*) *caspia knipowitschi* (Logvinenko & Starobogatov, 1966). – Kijashko in Bogutskaya et al.: 381–382, figs 152, 153, photo 53.
2016 *Adacna* (*Monodacna*) *caspia knipowitschi* (Logvinenko & Starobogatov, 1966). – Vinarski and Kantor: 67.

Status. Pontocaspian species, endemic to Caspian Sea. Uncertain whether it concerns a morph of *M. caspia*.

Type locality. Middle Caspian Sea Basin.

Distribution. Caspian Sea (middle and southern basins). This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Hypanis caspia knipowitchi*).

Taxonomic notes. See remarks under *Monodacna caspia* above for uncertain status of *M. knipowitschi*.

Conservation status. Not assessed.

Monodacna polymorpha (Logvinenko & Starobogatov, 1967)

*1967 *Hypanis angusticostata polymorpha* Logvinenko & Starobogatov, 1967: 232.
1973 *Hypanis angusticostata polymorpha* Logvinenko & Starobogatov, 1967. – Grossu: 141, fig. 22, pl. 1, fig. 7.
2013 *Adacna* (*Monodacna*) *polymorpha* (Logvinenko & Starobogatov, 1967). – Kijashko in Bogutskaya et al.: 383–384, fig. 159, photo 54.
2016 *Adacna* (*Monodacna*) *polymorpha* (Logvinenko & Starobogatov, 1967). – Vinarski and Kantor: 68.

Status. Pontocaspian species, endemic to Caspian Sea. Status uncertain.

Type locality. Central part of northern Caspian Sea.

Distribution. Northern Caspian Sea.

Taxonomic notes. See remarks under *M. albida* for uncertain species status.

Conservation status. Not assessed.

Monodacna semipellucida (Logvinenko & Starobogatov, 1967)

*1967 *Hypanis semipellucida* Logvinenko & Starobogatov: 232–233.

1973 *Hypanis semipellucida* Logvinenko & Starobogatov, 1967. – Grossu: 144, text fig. 27.
2013 *Adacna* (*Monodacna*) *semipellucida* (Logvinenko & Starobogatov, 1967). – Kijashko in Bogutskaya et al.: 384, fig. 161, photo 55.
2016 *Adacna* (*Monodacna*) *semipellucida* (Logvinenko & Starobogatov, 1967). – Vinarski and Kantor: 68–69.

Status. Pontocaspian species, endemic to Caspian Sea.

Type locality. Off Tokmak Cape (also as Toqmaq Müyis), southern Kazakhstan, Caspian Sea.

Distribution. Middle Caspian Sea.

Conservation status. Not assessed.

Family Semelidae Stoliczka, 1870

Abra segmentum (Récluz, 1843)

°1836 *Erycina ovata* Philippi: 13, pl. 1 fig. 13 [**non** *Erycina ovata* Gray, 1825].
*1843 *Syndosmya segmentum* Récluz: 365–366.
1969 *Abra ovata* (Phil.). – Logvinenko and Starobogatov: 339, fig. 355, pl. 5, fig. 12.
2013 *Abra segmenta* (Récluz, 1843). – Kijashko in Bogutskaya et al.: 391, fig. 165.
2015 *Abra ovata* (Philippi, 1836). – Latypov: 240.

Status. Invasive Pontocaspian species.

Type locality. Mediterranean coast near Taranto (Italy).

Distribution. Mediterranean, Black Sea coastal regions, Sea of Azov, Caspian Sea, Aral Sea.

Taxonomic notes. This species has been reported in much of the 20th century literature as *Abra ovata* (Philippi, 1836), which is invalid since the original name (*Erycina ovata* Philippi, 1836) represents a junior primary homonym of *Erycina ovata* Gray, 1825.

Remarks. The first transfer of *Abra segmentum* into the Caspian Sea occurred in 1947–1948, and the species has not been detected since 1955 (Latypov, 2015).

Conservation status. Not assessed.

Family Cyrenidae Gray, 1840

Corbicula fluminalis (Müller, 1774)

*1774 *Tellina fluminalis* Müller: 205–206.
1952 *Corbicula fluminalis* (Müller, 1774). – Zhadin: 317, fig. 283.
2012 *Corbicula fluminalis* (Müller, 1774). – Welter-Schultes: 15, unnumbered text figures.

2016 *Corbicula fluminalis* (O.F. Müller, 1774). – Nabozhenko and Nabozhenko: 62, text fig. 1(3, 4).
2016 *Corbicula fluminalis* (O.F. Müller, 1774). – Vinarski and Kantor: 80.

Status. Native/Invasive Pontocaspian species.

Type locality. Euphrates River.

Distribution. Native to large parts of western Asia (including southern Caspian river systems) and northern Africa, introduced in 1939 to southern North America and in 1980 from there to Europe (Seddon and Van Damme 2016). The species has been recently recorded from the Caspian Dagestan coast (Nabozhenko and Nabozhenko 2016).

Remarks. This species has been native to south Caspian rivers including the Kura river system (Zhadin 1952) and has expanded several times in the Late Pleistocene into the Caspian Sea, where in time intervals it survived in proximal lacustrine habitats. A recent introduction and expansion of the species has been recorded in the Kizlyarsky Gulf in Dagestan (Nabozhenko and Nabozhenko 2016) and the strong increase in fresh material found around the gulf in subsequent years, including whole specimens (AS Gasanova, Makhachkala, pers. comm.) suggests the species may have established there.

Conservation status. Least Concern (Seddon and Van Damme 2016).

Family Dreissenidae Gray, 1840

Remarks. Pontocaspian dreissenid taxonomy suffers from a lack of coordinated shell and DNA analyses. A large part of our considerations relies on the work of Rosenberg & Ludyanskiy (1994) who examined and illustrated all type material of Pontocaspian *Dreissena*.

Dreissena bugensis Andrusov, 1897

*1897 *Dreissensia bugensis* Andrusov: 285–286, pl. 15, figs 31–37.
1972 *Dreissena rostriformis bugensis* (Andrusov, 1897). – Scarlato and Starobogatov: 232–233, pl. 6, fig. 16.
1994 *Dreissena bugensis* (Andrusov, 1897). – Rosenberg and Ludyanskiy: 1479–1480, fig. 1a–e.
2013 *Dreissena bugensis* (Andrusov, 1897). – Kijashko in Bogutskaya et al.: 331, fig. 119.
2016 *Dreissena bugensis* (Andrusov, 1897). – Vinarski and Kantor: 78.

Status. Until mid-20th century endemic to northern Black Sea liman coast, since then invasive elsewhere in Black Sea Basin, Volga catchment, western Europe, and North America.

Type locality. Bug Liman near Nikolaev, Ukraine.

Distribution. Endemic to western Ukrainian liman coast, introduced in Danube Delta, Azov Sea, Volga catchment, western and central Europe, and North America (Orlova et al. 2005, Coughlan et al. 2017).

Taxonomic notes. This species has been considered as a subspecies of *D. rostriformis* (Deshayes, 1838) by some authors (e.g., Orlova et al. 2005), yet we follow the argumentation of Kijashko in Bogutskaya et al. (2013) to consider it as a distinct species. The proposed synonymy of Caspian *D. rostriformis* (= *D. grimmi*) and Black Sea *D. bugensis* by Stepien et al. (2013) is discussed below under *D. grimmi*.

Conservation status. Least Concern (von Rintelen and Van Damme 2011a).

Dreissena caspia Eichwald, 1855

*1855 *Dreissena caspia* Eichwald: 311–312, pl. 10, figs 19–21.
1969 *Dreissena caspia* (Eichw.). – Logvinenko and Starobogatov: 316–318, fig. 341(2).
1994 *Dreissena caspia* Eichwald, 1855. – Rosenberg and Ludyanskiy: 1482, fig. 3e, f.
2013 *Dreissena caspia* Eichwald, 1855. – Kijashko in Bogutskaya et al.: fig. 109.
2016 *Dreissena* (*Dreissena*) *caspia caspia* Eichwald, 1855. – Vinarski and Kantor: 76.

Status. Caspian endemic, probably extinct.

Type locality. Chistyi Bank and Cheleken Island, Caspian Sea, Russia.

Distribution. Caspian Sea and Aral Sea, probably extinct.

Taxonomic notes. The species is commonly subdivided into a Caspian subspecies (*D. caspia caspia*) and an Aral Sea subspecies (*D. caspia pallasi* Andrusov, 1897). However, syntypes of the latter illustrated in Rosenberg and Ludyanskiy (1994, fig. 3f) show a broad and keeled *Dreissena* that has major morphological characters in common with *D. polymorpha/elata* rather than *D. caspia*. Filippov and Riedel (2009) reported *Dreissena caspia* from Holocene core deposits of Aral Sea, but given the juvenile status of their material they noted they were uncertain whether it might comprise *D. polymorpha*. *Dreissena caspia* was reported alive from the remaining "small Aral Sea" by Plotnikov et al. (2016). However, this latter record concerns more likely *D. polymorpha* and needs confirmation. Andreeva and Andreev (2003) mentioned that this subspecies has not been found in the Aral Sea since 1989.

Conservation status. Critically endangered, possibly extinct (von Rintelen and Van Damme 2011b).

Dreissena elata Andrusov, 1897

*1897 *Dreissensia polymorpha* var. *elata* Andrusov: 353, pl. 20, fig. 25.
1969 *Dreissena elata* (Andr.). – Logvinenko and Starobogatov: 316, fig. 341(1).
1994 *Dreissena elata* Andrusov, 1897. – Rosenberg and Ludyanskiy: 1482, fig. 3g.
2013 *Dreissena elata* (Andrusov, 1897). – Kijashko in Bogutskaya et al.: fig. 108.
2016 *Dreissena* (*Dreissena*) *elata* (Andrusov, 1897). – Vinarski and Kantor: 76.

Status. Pontocaspian species, endemic to the Caspian Sea, probably extinct. Species status uncertain.

Type locality. Kuuli Cape, Dazmyk, Apsheron Peninsula, Azerbaijan (Vinarski and Kantor 2016).

Distribution. Caspian Sea. Probably extinct.

Taxonomic notes. *Dreissena elata* has morphological features in common with *D. polymorpha*, including a relatively wide shell and a well-pronounced keel located close to the ventral margin. However, the *D. elata* shell is in general wider, flatter, and has a more rounded abapical margin even though shell characters are higly variable. *Dreissena elata* has been reported from areas in the Caspian Sea with salinities well above 5 ‰, which is unusual for *D. polymorpha* elsewhere. We are uncertain whether *D. elata* might be a sibling species. Its apparently distinct morphology and autecological preferences suggest it is different from *D. polymorpha*, but it will require molecular comparison to investigate whether it concerns a mere morph that has undergone "ecological release" (Kohn 1972) or is a different species. However, no living specimens of *D. elata* have been recorded since 1957 (Kostianoy and Kosarev 2005) when its Caspian habitats were invaded by *Mytilaster minimus*.

Conservation status. Not assessed. It was reported as extinct by Kostianoy and Kosarev (2005, and references therein). If *D. elata* is accepted as a valid species, it might qualify for the same conservation status as *D. caspia* (critically endangered, possibly extinct; von Rintelen and Van Damme 2011b).

***Dreissena grimmi* (Andrusov, 1890)**
Fig. 4b

1877 *Dreyssena Brardii* var. *caspia* Grimm: 74–75 [**non** *Dreissena caspia* Eichwald, 1855].
*1890 *Dr.*[*eissena*] *Grimmi* Andrusov: 233 [**nom. nov.** pro *Dreissena caspia* Grimm, 1877, **non** Eichwald, 1855].
1897 *Dreissensia Grimmi* Andrus. – Andrusov: 279–282, pl. 16, figs 16–18.
1897 *Dreissensia rostriformis* var. *distincta* Andrusov: 273–278, pl. 14, figs 18–24.
1897 *Dreissensia Tschaudae* var. *pontocaspica* Andrusov: 294–297, pl. 9, figs 27–32, pl. 15, figs 29, 30.
1966a *Dreissena rostriformis compressa* Logvinenko and Starobogatov: 15–16, fig. 3.
1969 *Dreissena rostriformis grimmi* Andr. – Logvinenko and Starobogatov: 318, fig. 341(3).
1969 *Dreissena rostriformis pontocaspica* (Andr.). – Logvinenko and Starobogatov: 319, fig. 341(6).
1994 *Dreissena rostriformis* (Deshayes, 1838). – Rosenberg and Ludyanskiy: 1477–1479, figs 1f, 2a–j [**non** *Mytilus rostriformis* Deshayes, 1838].
2013 *Dreissena rostriformis* (Deshayes, 1838). – Kijashko in Bogutskaya et al.: 330 [**non** Deshayes, 1838].
2013 *D.*[*reissena*] *rostriformis compressa* Logvinenko & Starobogatov, 1966. – Kijashko in Bogutskaya et al.: 331, fig. 117a, photo 38.
2013 *D.*[*reissena*] *rostriformis distincta* (Andrusov, 1897). – Kijashko in Bogutskaya et al.: 331, fig. 117c.
2013 *D.*[*reissena*] *rostriformis grimmi* (Andrusov, 1890). – Kijashko in Bogutskaya et al.: 331, fig. 117b.
2013 *D.*[*reissena*] *rostriformis pontocaspica* (Andrusov, 1897). – Kijashko in Bogutskaya et al.: 331, fig. 117d.

Figure 4. Lectotype *Dreissena rostriformis* versus *D. grimmi*. **a** *D. rostriformis* Deshayes, 1838. Lectotype. Pliocene, Crimea. Reproduced from Archambault-Guezou (1976, pl. 6, fig 2a-2c) **b** RGM.961901, *D. grimmi* (Andrusov, 1890). Caspian Sea offshore Aktau, Kazakhstan, sample KAZ17-21, depth 44.3 m. Scale bar: 1 cm.

Status. Caspian Sea endemic.

Type locality. Caspian Sea.

Distribution. Middle to southern Caspian Sea basins. This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *D. rostriformis compressa*) and found living offshore Aktau (Kazakhstan) in 2017 below 20 m water depth.

Taxonomic notes. This Caspian species is very often cited as *Dreissena rostriformis*. Rosenberg and Ludyanskiy (1994: 1497) discuss the uncertainties of this attribution but state that "*D. pontocaspica, D. distincta, D. compressa*, and *D. grimmi* are synonyms of *D. rostriformis*" even though they find "some justification for maintaining a distinction between an extinct subspecies, *D. rostriformis rostriformis* and a living one, for which *D. rostriformis grimmi* is the oldest name". Their figure of the lectotype of *D. rostriformis* (Rosenberg and Ludyanskiy 1994: fig. 2a), which derives from Pliocene deposits of the Black Sea Basin, concerns a relative small, thick-shelled, and low *Dreissena* with a pointed beak and lacking a keel. On interior view, the shell area outside the pallial line is thick. Deshayes's lectotype has several characters in common with modern Caspian *D. rostriformis* and the closely related Black Sea Basin *D. bugensis*. Yet, the Pliocene form has a broader umbonal area that results in a more subquadrangular shape, which is different from the modern Caspian *Dreissena* that have tear-drop to pear-shaped shells. The subquadrangular shape of Deshayes's material is even more pronounced in the pallial line on the shell's interior, a feature not seen in any modern Caspian material. The Pliocene Black Sea *D. rostriformis* has its general shape in common with Apsheronian (Early Pleistocene) Caspian dreissenids referred to as *D. carinatocurvata* as illustrated in Kolesnikov (1950, pl. 14, figs 14–16). Hence, we conclude

that the recent Caspian species should be treated different from Pliocene *D. rostriformis* and the name *D. grimmi* should be applied instead.

Various subspecies have been attributed to Caspian *Dreissena rostriformis* (see, e.g., Kijashko in Bogutskaya et al. 2013 for a synonymy list). Even though morphological differences appear to be large, intermediates are known between the morphs. Stepien et al. (2013) reviewed molecular evidence for species boundaries within *Dreissena*. They concluded that (1) all Caspian Sea forms that have been mentioned in literature as (sub-) species of *D. rostriformis* (= *D. grimmi*) are one and the same species and (2) there is not enough molecular evidence and great difficulty in morphology to separate the Caspian species from the Black Sea Basin *D. bugensis*. We agree with the first point made by Stepien et al. (2013); all forms reported from the middle and southern Caspian Sea basins appear to be mere morphs of a single species, a feature also noted by Rosenberg and Ludyanskiy (1994). However, we disagree with their second proposal. *Dreissena bugensis* and *D. grimmi* have non-overlapping ecological tolerances and are separated geographically (Rosenberg and Ludyanskiy 1994). This fact together with the very limited but consistent genetic differentiation suggests that it may concern very recently evolved sister species. In the early 1980s, *D. bugensis* was introduced in the Volga (Zhulidov et al. 2005) and since then spread from there to central and western Europe and North America. So far, *Dreissena bugensis* has only been reported from the Volga itself and its delta but not from the northern Caspian Sea Basin. If it would be conspecific with the middle-southern Caspian species, which lives at higher salinities and deeper habitats, we would expect that the invasive populations in the north would have been blended with the Caspian population in the south. With no such intermediate populations found so far we consider both taxa as viable species.

Conservation status. Least Concern (for *Dreissena rostriformis*; von Rintelen and Van Damme 2011c).

Dreissena polymorpha (Pallas, 1771) s.l.

*1771 *Mytilus polymorphus* Pallas: 368, 435, 478.
1897 *Dreissensia Andrusovi* Andrusov: 374–376 pl. 18, figs 21–23.
1897 *Dreissensia Pallasi* Andrusov: 671–672, pl. 20, figs 33–35.
1897 *Dreissensia polymorpha* var. *aralensis* Andrusov: 354–355.
1897 *Dreissensia polymorpha* var. *obtusecarinata* Andrusov: 354.
1994 *Dreissena polymorpha* (Pallas, 1771). – Rosenberg and Ludyanskiy: 1480–1482, fig. 3a, b.
1994 *Dreissena polymorpha aralensis* Andrusov, 1897. – Rosenberg and Ludyanskiy: 1480, fig. 3c.
1994 *Dreissena polymorpha obtusecarinata* Andrusov, 1897. – Rosenberg and Ludyanskiy: 1481, fig. 3d.
1994 *Dreissena caspia pallasi* Andrusov, 1897. – Rosenberg and Ludyanskiy: 1482, fig. 3f.
2003 *Dreissena caspia pallasi* (Andrusov, 1897). – Andreeva and Andreev: 80, fig. 4.1(7–9).
2003 *Dreissena polymorpha aralensis* (Andrusov, 1897). – Andreeva and Andreev: 79, fig. 4.1(1–3).

2003 *Dreissena obtusecarinata* (Andrusov, 1897). – Andreeva and Andreev: 80, fig. 4.1(4–6).
2013 *Dreissena* (*Dreissena*) *polymorpha* (Andrusov, 1897). – Kijashko in Bogutskaya et al.: 328, fig 118a [pars, status fig. 118b uncertain].
2016 *Dreissena* (*Dreissena*) *polymorpha polymorpha* (Andrusov, 1897). – Vinarski and Kantor: 75.
?2016 *Dreissena* (*Dreissena*) *polymorpha andrusovi* (Brusina in Andrusov, 1897). – Vinarski and Kantor: 75.
?2016 *Dreissena* (*Dreissena*) *polymorpha aralensis* (Andrusov, 1897). – Vinarski and Kantor: 75.
?2016 *Dreissena* (*Dreissena*) *polymorpha obtusecarinata* (Andrusov, 1897). – Vinarski and Kantor: 76.
?2016 *Dreissena* (*Dreissena*) *caspia pallasi* (Andrusov, 1897). – Vinarski and Kantor: 7.

Status. Native Pontocaspian species.

Type locality. Volga and Yaik (Ural) rivers, Caspian Sea.

Distribution. Eurasian (native and invasive), North America (invasive) rivers, lakes, estuaries, deltas (Rosenberg and Ludyanskiy 1994, Cummings and Graf 2015, Coughlan et al. 2017). Several unique forms/species within this group reported from the Pontocaspian region.

Taxonomic notes. *Dreissena polymorpha* has been subject of intense DNA and ecological studies, but rarely were Caspian communities involved. Combined insights into the shell morphology, ecology, and molecular biology has to date not fully resolved several aspects of Pontocaspian records of this species. Occurrences in rivers and deltas of the Pontocaspian region are consistently attributed to *Dreissena polymorpha*. However, slightly deviating morphs exist(ed) in salinities typically not favoured by *D. polymorpha* elsewhere in the Caspian and Aral seas. A particular form of *Dreissena polymorpha*, documented by Kijashko in Bogutskaya et al. (2013), viz. *D. polymorpha andrusovi* (his figure 118b) will need further study as it has many morphological similarities with *D. caspia* (including general shape, location of semidiameter, and broad flat shape of hinge platform).

Conservation status. Least Concern (Van Damme 2014).

Mytilopsis leucophaeata (Conrad, 1831)

*1831 *Mytilus leucophaeatus* Conrad: 263–264, pl. 11, fig. 13.
2013 *Mytilopsis leucophaeata* (Conrad, 1831). – Kijashko in Bogutskaya et al.: 320, fig. 107.

Status. Invasive Pontocaspian species.

Type locality. Southern coast of eastern United States.

Distribution. Black Sea Basin, Caspian Sea, coasts of western Europe, Caribbean, and northern South America.

Remarks. The species, native to the southern coast of North America, was first introduced in Europe in 1835 (Heiler et al. 2010). In the Pontocaspian region, it first

appeared in the northern Black Sea Basin in 2002 and was first collected in the Caspian Sea in 2009 (Heiler et al. 2010). It is easily distinguished from Pontocaspian dreissenids by the presence of an aphophysis near the hinge.

Conservation status. Least Concern (Cummings 2011).

Gastropoda

Family Neritidae Rafinesque, 1815

Theodoxus danubialis (Pfeiffer, 1828)

*1828 *Nerita danubialis* Pfeiffer: 48, pl. 8, figs 17, 18.
2009 *Theodoxus danubialis* (C. Pfeiffer, 1828). – Fehér et al.: figs 2a–k, 4a–c, 5a–c.
2012 *Theodoxus danubialis* (Pfeiffer, 1828). – Welter-Schultes: 27, unnumbered text figures.
2016 *Theodoxus* (*Theodoxus*) *danubialis* (Pfeiffer, 1828). – Vinarski and Kantor: 156 [and synonyms therein].

Status. Accepted native species.

Type locality. Danube River, Vienna, Austria.

Distribution. Danube River catchment, central to south-eastern Europe, as well as northern Italy (Fehér et al. 2009).

Taxonomic notes. The latest phylogenetic data supports a sister relationship between *Theodoxus danubialis* and the clade containing *T. fluviatilis* and *T. velox* (AFS, unpublished data). Some authors believe *T. danubialis* and *T. prevostianus* may represent different species given some level of genetic, ecological, and morphological differentiation (Fehér et al. 2009, Welter-Schultes 2012; but see also Bandel 2001). More recent unpublished results may suggest that the genetic level of differentiation between these species is more indicative of intraspecific diversity within a single species (AFS, unpublished data).

Conservation status. Least Concern (Tomovic et al. 2010).

Theodoxus fluviatilis (Linnaeus, 1758)

*1758 *Nerita fluviatilis* Linnaeus: 777.
1865 *Theodoxus fluviatilis* var. *subthermalis* Issel: 22–23.
1886 *Neritina euxina* Clessin: 55.
1908 *Neritina danubialis* var. *danasteri* Lindholm: 214–215.
?1972 *Theodoxus dniestroviensis* Put': 80–82, text fig. 5.
?1999 *Th. dniestroviensis* Put', 1972. – Anistratenko et al.: 19, figs 4, 8.
1999 *Th. fluviatilis* (Linnaeus, 1758). – Anistratenko et al.: 13–15, figs 3, 4.
2005 *Theodoxus fluviatilis* (Linnaeus, 1758). – Anistratenko: 7–8, text figs 3, 4.
2012 *Theodoxus euxinus* (Clessin, 1886). – Welter-Schultes: 27, unnumbered text figures.
2012 *Theodoxus fluviatilis* (Linnaeus, 1758). – Welter-Schultes: 28, unnumbered text figures.

2015 *Theodoxus fluviatilis* (Linnaeus, 1758). – Glöer and Pešić: 88–91, figs 1, 3–5, 9, 13–34.
2016 *Theodoxus* (*Theodoxus*) *fluviatilis* (Linnaeus, 1758). – Vinarski and Kantor: 154–155 [pars, excluding synonyms *sarmatica* and *velox*].
2016 *Theodoxus* (*Theodoxus*) *euxinus* (Clessin, 1886). – Vinarski and Kantor: 155.
2016 *Theodoxus* (*Theodoxus*) *subthermalis* (Bourguignat in Issel, 1865). – Vinarski and-Kantor: 157–158.

Status. Accepted native species.

Type locality. Near Uppsala, Sweden. The lectotype was designated by Anistratenko (2005).

Distribution. Widely distributed all over Europe, Anatolia, and north-western Africa. Within the Pontocaspian region, it is a common component of the lower reaches of Black and Azov Sea drainages (specifically in Bulgaria, Romania, and Ukraine). Towards the east, the species extends at least as far as the Don River system in Russia and the coastal rivers of Georgia, but it is absent from the Caspian system. Records of this species from Iran and western Asia are likely misidentifications (AFS, unpublished data).

Taxonomic notes. *Theodoxus fluviatilis* exhibits considerable variation in shell colouration and shape (Glöer and Pešić 2015). Unpublished molecular data confirm the synonymy of a number of taxa such as *Theodoxus euxinus* syn. n., *T. danasteri*, and *T. subthermalis* syn. n., and further suggest the inclusion of *T. saulcyi* and *T. heldreichi* (AFS, unpublished data). A final decision concerning the status of *T. dniestrovien-sis* Put', 1972 described from the Dniester River (Rukhotyn village, Khotyn district, Chernivtsi region, Ukraine) is not possible at the moment. Despite appropriate efforts, we were unable to trace the type specimens of this species. Based on the original description and illustration (Put' 1972) it was considered as a junior synonym of *T. fluviatilis* by Anistratenko et al. (1999) having an unusual colour pattern. *Theodoxus milachevichi* was described as a subfossil from the Crimean coast. It closely resembles morphotypes of both *T. fluviatilis* and *T. velox* V. Anistratenko in O. Anistratenko et al., 1999 and might be synonym of either species (compare type material illustrated in Kantor and Sysoev 2006). However, the morphological variability of the taxa involved, as well as the lacking possibility of acquiring genetic data for *T. milachevichi*, complicates a decision on the independence or synonymy of this species.

Conservation status. Least Concern (Kebapçı and Van Damme 2012).

Theodoxus pallasi Lindholm, 1924

°1838 *Neritina liturata* Eichwald: 156–157 [**non** *Neritina liturata* Schultze, 1826].
*1924 *Theodoxus pallasi* Lindholm: 33, 34 [**nom. nov.** pro *Neritina liturata* Eichwald, 1838, **non** Schultze, 1826].
1947 *Theodoxus* (*Theodoxus*) *pallasi* var. *nalivkini* Kolesnikov: 106, 110.
1976 *Theodoxus pallasi* Lindholm, 1924. – Akramovskiy: 88, text fig. 23, pl. 1, figs 1, 2.
1994 *Theodoxus astrachanicus* Starobogatov in Starobogatov, Filchakov, Antonova and Pirogov: 8–9, fig. 1(1, 2).
1994 *Theodoxus astrachanicus* Starobogatov et al.: 8–9, fig. 1(1, 2).

2009 *Theodoxus pallasi* Lindholm, 1924. – Filippov and Riedel: 70, 72, 74, 76, fig. 4g–i.
2011 *Theodoxus astrachanicus* Starobogatov in Starobogatov, Filchakov, Antonova & Pirogov, 1994. – Anistratenko et al.: 54–55, fig. 1(6).
2012 *Theodoxus pallasi* Lindholm, 1924. – Welter-Schultes: 29, unnumbered text figures.
2016 *Theodoxus* (*Theodoxus*) *astrachanicus* Starobogatov in Starobogatov, Filchakov, Antonova & Pirogov, 1994. – Vinarski and Kantor: 155–156.
2016 *Theodoxus* (*Theodoxus*) *pallasi* (Lindholm, 1924). – Vinarski and Kantor: 156–157 [and synonyms therein].
2017 *Theodoxus pallasi* Lindholm, 1924. – Anistratenko et al.: 221, figs 4, 7, 10, 11.
2018 *Theodoxus pallasi* Lindholm, 1924. – Neubauer et al.: 48–51, fig. 4A–F.

Status. Accepted Pontocaspian species, name uncertain.

Type locality. "Inter Fucos littoris Derbendensis viva" (living among algae on the shores of Derbent), Dagestan, Russia.

Distribution. Present along the Caspian Sea shores, in the Volga River, and the Sea of Azov. Lived until the late 1980s in the Aral Sea but is possibly extinct there now (Andreev et al. 1992, Aladin et al. 1998, Micklin et al. 2014).

Taxonomic notes. Eichwald (1838) introduced the species *Neritina liturata* based on material from the shores of Derbent (Dagestan, Russia, northwestern Caspian Sea). That name is invalid as it is a junior primary homonym of *N. liturata* Schultze, 1826; it was replaced by Lindholm (1924) with *Theodoxus pallasi* (see also Anistratenko et al. 2017). *Theodoxus pallasi* is a widely used name, but a major nomenclatural change might be due. Unpublished molecular data suggest that all *Theodoxus* from the Caspian Sea, Azov Sea, and Armenian lakes Sevan and Yerevan, as well as several mineral springs and streams in the Khorasan provinces of Iran, belong to a single species (AFS, unpublished results). The oldest name available for that group is *Theodoxus major* Issel, 1865, described from Lake Sevan in Armenia (originally as variety of the unavailable name *T. schirazensis*). Akramovskiy (1976) noted the similarity of *T. pallasi* and *T. major* and considered the latter as a morphotype of the former. Although he did not explicitly state it, he thereby suggested the two taxa to be synonymous. This view was adopted by Vinarski and Kantor (2016), who listed *major* in synonymy of *pallasi*, although Issel's (1865) name has priority. The potential synonymy also involves *T. schultzii*. Despite the characteristic appearance of the syntypes, the presence of intermediate morphologies in samples taken on shores of Azerbaijan and Kazakhstan in 2016 and 2017 (pers. obs. OA, VA, FW) indicates a close relationship with *T. pallasi.* The radulae of these two species differ in the relative width of the central and marginal teeth (see Zettler 2007 and compare Anistratenko et al. 2017).

Unfortunately, the types of *T. major*, supposed to be in the Museo Regionale di Scienze Naturali, Torino, are inaccessible at the moment due to museum renovation (E Gavetti, pers. comm., Oct 2018). We refrain from a final conclusion on the synonymy of the species involved until information on the types of all taxa as well as published molecular data are available. For details on the taxonomic relationship between *T. pallasi* and *T. astrachanicus*, see discussion in Anistratenko et al. (2017).

Conservation status. Data Deficient (Van Damme and Kebapçı 2014).

Theodoxus schultzii (Grimm, 1877)

*1877 *Neritina Schultzii* Grimm: 77–78, pl. 7, fig. 5, pl. 8, fig. 16.
1909 *Neritina* (*Ninnia*) *Schultzei* [sic] Grimm. – Andrusov: 106–107, pl. 6, fig. 38.
?1947 *Theodoxus* (*Ninnia*) *schultzi* [sic] var. *jukovi* Kolesnikov: 106, 110.
1950 *Theodoxus* (*Ninnia*) *schultzei* [sic] (Grimm). – Kolesnikov: 215–216, pl. 26, figs 12, 13.
1969 *Theodoxus schultzi* [sic] (Grimm, 1877). – Logvinenko and Starobogatov: 344, fig. 357.
?1974 *Theodoxus zhukovi* [sic] Kolesnikov, 1947. – Starobogatov: 255, text fig. 223.
2007 *Theodoxus* (*Theodoxus*) *schultzii* (Grimm, 1877). – Zettler: 249, figs 2–5.
2016 *Theodoxus* (*Theodoxus*) *schultzii* (Grimm, 1877). – Vinarski and Kantor: 157.

Status. Pontocaspian species, status uncertain.

Type locality. Caspian Sea, in two localities, given by Grimm (1877) as 43°17'N, 01°03'E, 40 fathoms, and 42°48'N, 01°22'E, 48 fathoms. Since the longitude was calculated relative to the geographic position of Baku, situated approximately at 50E, the correct longitude should be about 51°00'E (Vinarski and Kantor 2016).

Distribution. Middle and southern Caspian Sea basins, between 15 and 100 m (Logvinenko and Starobogatov 1969).

Taxonomic notes. See discussion of *T. pallasi* for notes on the potential synonymy with *T. major* Issel, 1865. The status of *T. jukovi* still requires confirmation (Vinarski and Kantor 2016).

Conservation status. Not assessed.

Theodoxus velox V. Anistratenko in O. Anistratenko et al., 1999

*1999 *Th.*[*eodoxus*] *velox* V. Anistratenko in O. Anistratenko et al.: 17–18, fig. 4(7).

Status. Pontocaspian species, name uncertain.

Type locality. Dnieper Delta, Zbur'ivka liman, Ukraine.

Distribution. This species was believed to be restricted to drainage systems of the northern Black Sea coast (even though the Oskol River lies far from the Black Sea coast), but unpublished molecular data suggest it may be distributed as far north as the eastern part of the Baltic Sea and as far south as Anatolia (AFS, unpublished data).

Taxonomic notes. The species was listed as junior synonym of *T. fluviatilis* by Vinarski & Kantor (2016). *Theodoxus velox* is indeed challenging to differentiate from some regional morphotypes of that species given the overlap in shell patterns. Unpublished molecular data indicate however that *T. velox* belongs to a different molecular clade (AFS, unpublished data). The distribution range of that clade overlaps with the range of *T. sarmaticus* (Lindholm, 1901), which is widely accepted as a junior synonym of *T. fluviatilis* in the literature (e.g., Vinarski and Kantor 2016). A revision of the taxa involved and study of the type material is required to solve the synonymy issues.

Conservation status. Not assessed.

Family Cochliopidae Tryon, 1866

Eupaludestrina stagnorum (Gmelin, 1791)

*1791 *Helix stagnorum* Gmelin: 3653.
1975 *Falsihydrobia streletzkiensis* Chukhchin: 121.
2012 *Heleobia stagnorum* (Gmelin, 1791). – Welter-Schultes: 39, unnumbered text figures.
2012 *Semisalsa stagnorum* (Gemlin, 1791). – Kroll et al.: 1520.

Status. Accepted, native Pontocaspian or immigrant species.

Type locality. Kaasjeswater, Zierikzee, the Netherlands.

Distribution. Coastal areas of Europe and the Mediterranean region, extending to North Africa and east to Iran (Glöer 2002). Occurrence in Black Sea according to, e.g., Chukhchin (1975) and in the Caspian Sea (TW, unpublished data).

Taxonomic notes. We find the attribution of this species to the genus *Eupaludestrina* unsatisfactory, yet a further revision is required to establish and stabilise the generic attribution as there is considerable confusion. It is commonly classified in the South American genus *Heleobia* (e.g., Prié 2011), whereas Kroll et al. (2012) suggested that this species belongs to the genus *Semisalsa*, a group of European Cochliopidae distinct from *Heleobia*. However, *Semisalsa* is currently listed as junior synonym of *Eupaludestrina* Mabille, 1877 (type species: *Hydrobia macei* Paladilhe, 1867, by subsequent designation by Kadolsky 2008). Following Kadolsky (2008), *Eupaludestrina* is currently ranked as subgenus of *Heleobia* in MolluscaBase (2018), but both the phylogenetic and geographic distinction of the European and American species suggest separation on the genus level.

Remarks. It is unclear whether the species is native to the Pontocaspian area or a recent immigrant.

Conservation status. Least Concern (Prié 2011).

Family Hydrobiidae Stimpson, 1865

Remarks. The Hydrobiidae form the most species-rich mollusc group in the Pontocaspian region. However, in general, useful shell characters are few and highly variable (Wilke and Delicado in press). Descriptions in the past have often been very general, and illustrations of types are notably poor for several of the endemic taxa. A strong tendency of naming large numbers of species has developed throughout the 20th century (e.g., Logvinenko and Starobogatov 1969), but for some groups where morphological and genetic analyses could be performed (e.g., *Caspiohydrobia* spp.) it has been demonstrated that actual species numbers were much lower than the number of species described (Haase et al. 2010). For many of the endemic species, especially in the genus *Turricaspia*, the apparent loss of types, combined with the lack of living material makes it impossible to assess their taxonomic status. Currently, a number of taxonomic works is in progress on the endemic Pontocaspian hydrobiid groups, and some different insights on the genus-level classifications exist. Here, we adopt a conservative approach, mostly based on Neubauer et al. (2018).

Subfamily Caspiinae Dybowski, 1913

Remarks. The distinction of the genera *Caspia*, *Ulskia*, and *Clathrocaspia* follows Neubauer et al. (2018). The three taxa are differentiated based on details of the protoconch and the expression of teleoconch sculpture. *Caspia* s. s. is characterised by a single distinct but fine spiral keel below the suture. It is usually smooth, yet within the type species some reticulate ornament can be found. Species of *Clathrocaspia* expose a distinctive, reticulate pattern on the teleoconch and a malleate protoconch with faint spiral threads. The aperture of *Clathrocaspia* often develops a distinct flat base. The discinction of the two genera is subject of current research. *Ulskia* also has a malleate protoconch but with more distinct spiral threads; teleoconch sculpture is occasionally present as minute elongate nodules.

Caspia baerii Clessin & Dybowski in Dybowski, 1887

*1887 *Caspia Baerii* Clessin & Dybowski in Dybowski: 36–37.
1888 [*Caspia*] *Baerii* n. sp. – Dybowski: 79, pl. 3, fig. 4a, b.
1969 *Pyrgula* (*Caspia*) *baerii* (Cless. & Dyb.). – Logvinenko and Starobogatov: 377, fig. 367(3).
2016 *Caspia baerii* Clessin & W. Dybowski in W. Dybowski, 1888. – Vinarski and Kantor: 224.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Caspian Sea and possibly Danube Delta (Romania). This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia baerii*).

Taxonomic notes. The type material is stored in the von Baer collection of Caspian Sea molluscs in the Zoological Museum of Lviv University (Ukraine) and comprises more than a hundred syntypes (Anistratenko et al. 2018). The slender shell, the presence of a fine spiral keel below the suture, and the occasionally weakly reticulated surface distinguish this species from congeners.

Conservation status. Not assessed.

Caspia valkanovi (Golikov & Starobogatov, 1966)

*1966 *P.*[*yrgula*] (*Caspia*) *baeri* [sic] *valkanovi* Golikov & Starobogatov: 354–355, fig. 1(9).
2006 *Caspia valkanovi* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 88, pl. 41, fig. N.

Status. Pontocaspian species, identity uncertain.

Type locality. Off Crimea, station 18, sample 173.

Distribution. Endemic to the Black Sea Basin.

Taxonomic notes. The identity and status of this subfossil taxon, described from phaseoline silt, are somewhat uncertain. The holotype illustrated in Kantor and Sysoev (2006) is poorly preserved and does not allow a proper assessment of its validity. The general shape and size are indicative of the genus *Caspia* and it looks like a variety that might even be a synonym of *C. baerii*. Furthermore, we are not entirely certain as to the stratigraphic age of the stratigraphic origin of this species. The phaseoline silt is a marine Holocene unit, yet it contains reworked Late Pleistocene Neoeuxinian (Pontocaspian) species (FW, pers. obs.).

Conservation status. Not assessed.

Clathrocaspia brotzkajae (Starobogatov in Anistratenko & Prisjazhnjuk, 1992)

*1992 *Caspia* (*Clathrocaspia*) *brotzkajae* Starobogatov in Anistratenko & Prisjazhnjuk: 18–19, fig. 2a.
2016 *Caspia brotzkajae* Starobogatov in Anistratenko & Prisjazhnjuk, 1992. – Vinarski and Kantor: 224.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea shores of Dagestan, Russia, at ca. 60 m.

Distribution. Presently endemic to the Caspian Sea. The species was also recorded from the Holocene of Danube Delta, Ukraine (Anistratenko and Prisjazhnjuk 1992).

Taxonomic notes. The species differs from its congeners in the bulbous shape, with a ratio of body whorl height/shell height of approx. 3/4, as well as regarding the expanded aperture.

Conservation status. Not assessed.

Clathrocaspia gmelinii (Clessin & Dybowski in Dybowski, 1887)

*1887 *Caspia Gmelinii* Clessin & Dybowski in Dybowski: 37–38.
1888 [*Caspia*] *Gmelini* [sic] n. sp. – Dybowski: 79, pl. 3, fig. 7a, b.
1969 *Pyrgula* (*Caspia*) *gmelinii* (Cless. & W. Dyb.). – Logvinenko and Starobogatov: 378, fig. 367(7).
?1969 *Pyrgula* (*Caspia*) *sowinskyi* Logvinenko and Starobogatov: 378, fig. 367(4).
?1977 *Pyrgula* (*Caspia*) *gaillardi* Tadjalli-Pour: 107, pl. 2, fig. 8.
2015 *Caspia gmelinii* Clessin & W. Dybowski, 1887. – Boeters et al.: 178, figs 1–6.
2016 *Caspia gmelinii* Clessin & W. Dybowski in W. Dybowski, 1888. – Vinarski and Kantor: 224.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea, recorded from the middle and southern parts. This species was mentioned from depths between 200 and 300 m in the

South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia gmelinii*).

Taxonomic notes. The broad shell and the heavily reticulated surface distinguish this species from congeners. *Pyrgula sowinskyi*, from the middle and southern Caspian Sea, and *P. gaillardi*, from the Caspian Sea shore between Astara and Hashtpar (= Talesh), Iran, closely resemble *C. gmelinii* in terms of shell shape, the shape of the aperture, and the distinct reticulate teleoconch sculpture. Very likely, the two species are synonyms of *C. gmelini*. Since the type material of Logvinenko and Starobogatov (1969) has not been found, and the whereabouts of the material of Tadjalli-Pour (1977) is unknown, a re-examination of these species has to be postponed. Here, we suggest to treat them as nomina dubia until more information becomes available.

Conservation status. Data Deficient (same for *P. sowinskyi*; Son 2011a, Vinarski 2011o).

Clathrocaspia isseli (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Caspia*) *isseli* Logvinenko & Starobogatov: 378, fig. 367(6).
2016 *Pyrgula isseli* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 239.

Status. Pontocaspian species, identity uncertain.

Type locality. Southern Caspian Sea (no details), between 40–75 m water depth.

Distribution. Endemic to the Caspian Sea.

Taxonomic notes. This species hardly differs from *C. pallasii* and might be a junior synonym. Observations on Holocene material from the southern and northern Caspian Sea shores (VA, TN, FW) suggest that the minor differences range within intraspecific variability but further studies (preferentially involving DNA) are required to solve the identity of this taxon. The classification in *Clathrocaspia* is based on the reticulate sculpture typical of that genus.

Conservation status. Data Deficient (Vinarski 2011j).

Clathrocaspia knipowitschii (Makarov, 1938)

*1938 *Caspia gmelini* [sic] var. *Knipowitschii* Makarov: 1058.
?1966 *P.*[*yrgula*] (*Caspia*) *gmelini* [sic] *aluschtensis* Golikov and Starobogatov: 354, fig. 1(8).
1966 *P.*[*yrgula*] (*Caspia*) *makarovi* Golikov and Starobogatov: 353–354, fig. 1(5).
?1987 *Caspia gmelinii stanislavi* Alexenko and Starobogatov: 33, fig. 1.
1992 *Caspia* (*Clathrocaspia*) *knipowitchi* Makarov, 1938. – Anistratenko and Prisjazhnjuk: 19, fig. 2b.
2006 *Caspia knipowitchi* [sic] Makarov, 1938. – Kantor and Sysoev: 87–88, pl. 41, fig. J.
2006 *Caspia makarovi* (Golikov et Starobogatov, 1966). – Kantor and Sysoev: 88, pl. 41, fig. L.
2013 *Caspia knipowitchii* [sic] Makarov, 1938. – Anistratenko: 53–55, figs 1A–I, 3A–D, 5A–D.

2013 *Caspia makarovi* (Golikov & Starobogatov, 1966). – Anistratenko: 56–59, figs 2A–E, 3E.
2016 *Caspia knipowitchi* [sic] Makarov, 1938. – Vinarski and Kantor: 224.
2016 *Caspia makarovi* (Golikov & Starobogatov, 1966). – Vinarski and Kantor: 225.
?2016 *Caspia stanislavi* Alexenko & Starobogatov, 1987. – Vinarski and Kantor: 225.

Status. Accepted Pontocaspian species.

Type locality. Ukraine, in the Dniester River (exact locality not specified).

Distribution. Azov Sea and northern Black Sea Basin. Known from the Holocene of Danube Delta, Ukraine (Anistratenko and Prisjazhnjuk 1992).

Taxonomic notes. *Clathrocaspia knipowitschii*, *C. makarovi*, *C. gmelini aluschtensis*, and *C. stanislavi* were all described from the northern margin of the Black Sea. After detailed morphological comparison of *C. knipowitschii* and *C. makarovi* syn. n. and preliminary genetic analyses (TW, unpublished data), we conclude that both taxa should be considered synonyms. Very likely, also *C. gmelini aluschtensis* and *C. stanislavi* are synonyms of *C. knipowitschii*, but a final decision on that matter requires investigation of the type material.

Conservation status. Least Concern (same for *C. makarovi*; Son 2011b, c).

Clathrocaspia logvinenkoi (Golikov & Starobogatov, 1966)

*1966 *P.*[*yrgula*] (*Caspia*) *logvinenkoi* Golikov & Starobogatov: 354, fig. 1(7).
2006 *Caspia logvinenkoi* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 88, pl. 41, fig. I.
2007a *Caspia* (*Clathrocaspia*) *logvinenkoi* (Golikov & Starobogatov, 1966). – Anistratenko: 25–26, fig. 2.
2016 *Caspia logvinenkoi* (Golikov & Starobogatov, 1966). – Vinarski and Kantor: 224–225.

Status. Accepted Pontocaspian species.

Type locality. Don Delta, Russia.

Distribution. Known only from the type locality.

Taxonomic notes. The species has distinctive shell characters: broad conical shape with a weak subsutural bulge and apically thickened peristome.

Remarks. The type material was collected by Mordukhay-Boltovskoy in 1937 and comprises two specimens, the holotype and the paratype. Three additional specimens were collected from the same region in 2006 (Anistratenko 2007a). The salinity at the type locality fluctuates between freshwater and ca. 1‰.

Conservation status. Not assessed. In the fifty years since the description of this species five specimens have been collected; this is likely evidence of its rarity. Known only from two close localities, *C. logvinenkoi* appears to have an extremely narrow distributional range in the Azov–Black Sea Basin, being endemic to the Taganrog province (e.g., Anistratenko 2007a).

Clathrocaspia milae (Boeters, Glöer & Georgiev, 2015)

*2015 *Caspia milae* Boeters, Glöer & Georgiev in Boeters et al.: 180–183, figs 9–21.

Status. Pontocaspian species, identity uncertain.

Type locality. Bulgaria, Danube Island Vardim (43°37'N, 25°28'E).

Distribution. Only known from type locality.

Taxonomic notes. This species closely resembles *C. knipowitschii* concerning shape, size, and sculpture. According to Boeters et al. (2015), the two species differ in the degree of cover of the umbilicus, the shape of the peristome and the size and number of whorls of the protoconch. Molecular and/or more in-depth morphological and anatomical studies are required to confirm that these apparently minor differences are sufficient to separate the species.

Remarks. If the species would be confirmed, it concerns a Pontocaspian species whose distribution currently is outside prime Pontocaspian habitat, yet Boeters et al. (2015) implied they would expect that several of the *Caspia* records from the lower Danube and Razim Lake complex might be attributed to *C. milae* as well. The Razim Lake complex is Pontocaspian habitat.

Conservation status. Not assessed.

Clathrocaspia pallasii (Clessin & Dybowski in Dybowski, 1887)

*1887 *Caspia Pallasii* Clessin & Dybowski in Dybowski: 37.
1888 *Caspia Pallasii* n. sp. – Dybowski: 79, pl. 3, fig. 3a, b.
1969 *Pyrgula* (*Caspia*) *pallasii* (Cless. & W. Dyb.). – Logvinenko and Starobogatov: 378, fig. 367(5).
2016 *Pyrgula pallasii* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 241.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea.

Taxonomic notes. This species differs from the other Caspian species *C. gmelinii* in its very slender shape.

Conservation status. Not assessed.

Ulskia behningi (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Ulskia*) *behningi* Logvinenko & Starobogatov: 380, fig. 367(13).
2016 *Pyrgula behningi* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 236.

Status. Pontocaspian species, identity uncertain.

Type locality. Western part of the southern Caspian Sea, in the vicinity of the Kura River mouth, 39°05'N, 49°48'E, 120 m.

Distribution. Type locality only.

Taxonomic notes. The drawings provided by Logvinenko and Starobogatov (1969) sketch a broad and conical shell. As such, it differs from the more elongate and ovoid *Ulskia ulskii* (Neubauer et al. 2018). A revision is required to clarify its taxonomic status.

Conservation status. Data Deficient (Vinarski 2011f).

?*Ulskia derzhavini* (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Ulskia*) *derzhavini* Logvinenko & Starobogatov: 379, fig. 367(9).
2016 *Pyrgula derzhavini* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 237.

Status. Pontocaspian species, identity uncertain.

Type locality. Middle and southern Caspian Sea, 45–81 m.

Distribution. Type locality only.

Taxonomic notes. The species differs from *U. ulskii* and *U. behningi* in the very slender elongate shape and the presence of a subsutural band; this suggests *P. derzhavini* might be likely a member of *Caspia* s.s. A revision is required to clarify its taxonomic status and generic placement.

Conservation status. Not assessed.

Ulskia ulskii (Clessin & Dybowski in Dybowski, 1887)

*1887 *Caspia Ulskii* Clessin & Dybowski in Dybowski: 38–39.
1888 [*Caspia*] *Ulskii* n. sp. – Dybowski: 79, pl. 3, fig. 8a, b.
1969 *Pyrgula* (*Ulskia*) *nana* Logvinenko and Starobogatov: 379–380, fig. 367(12).
1969 *Pyrgula* (*Ulskia*) *schorygini* Logvinenko and Starobogatov: 379, fig. 367(11).
2016 *Pyrgula ulskii* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 244.
2018 *Ulskia ulskii* (Clessin & W. Dybowski in W. Dybowski, 1887). – Neubauer et al.: 52–54, fig. 5A–K [and synonyms therein].

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Western part of the Caspian Sea. This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia ulskii*, *T. schorgyni,* and *T. nana*).

Taxonomic notes. This species was recently studied by Neubauer et al. (2018), who considered *P. nana* and *P. schorygini* as its junior synonyms.

Conservation status. Not assessed.

Subfamily Hydrobiinae Stimpson, 1865

Remarks. In addition to the taxa discussed below, the following species of Hydrobiinae have been mentioned from the Black Sea basin (updated statuses after MolluscaBase 2018a): *Hydrobia aciculina* (Bourguignat, 1876), *H. acuta* (Draparnaud, 1805), *H. euryomphala* (Bourguignat, 1876), *H. mabilli* (Bourguignat, 1876) [currently accepted as *Peringia mabilli*], *H. macei* Paladilhe, 1867 [currently accepted as *Heleobia macei*], *H. procerula* (Paladilhe, 1869) [currently considered a synonym of *H. acuta*] (Anistratenko et al. 2011). These species were described from the Western Mediterranean and their occurrence in the Black Sea region requires re-investigation; partly the records might be misidentifications of the species of *Ecrobia* listed below or *Eupaludestrina* (Cochliopidae) listed above.

Ecrobia grimmi (Clessin in Dybowski, 1887)

*1887 *Hydrobia grimmi* Clessin in Dybowski: 55–56.
1888 [*Hydrobia*] *grimmi* Clessin. – Dybowski: 79, pl. 3, fig. 2.
2009 *Caspiohydrobia grimmi* (Clessin & Dybowski, 1888). – Filippov and Riedel: 70–72, 74–76, fig. 4a–d.

Status. Accepted native Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Caspian Sea; Aral Sea; salt lakes near Chelyabinsk, Russia (Shishkoedova 2010); Lake Sawa, Iraq (Haase et al. 2010); Arabian (Persian) Gulf (Glöer and Pešić 2012); possibly also northern and central Kazakhstan and Tajikistan (Vinarski and Kantor 2016), however, no molecular data are known to confirm the identity of the Central Asian snails. This species was mentioned from depths between 200 and 500 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Caspiohydrobia curta* and *C. gemma*).

Taxonomic notes. Most of the species that have been assigned to the genus *Caspiohydrobia* Starobogatov, 1970, including its type species, *Pyrgohydrobia eichwaldiana* Golikov & Starobogatov, 1966, range within the morphological variability of *E. grimmi*. Previous examination of some *Caspiohydrobia* juvenile shells (Filippov and Riedel 2009, Anistratenko 2013, fig. 4A–C) as well as reproductive systems and radula did not find any criteria to support differentiation. Probably, all of the thirty *Caspiohydrobia* species listed by Kantor and Sysoev (2006) and Vinarski and Kantor (2016) for the Caspian Sea are morphotypes of a single species. Prelimary genetic analyses of *Caspiohydrobia* spp. from salt lakes near Chelyabinsk, Russia (TW, unpublished data) support this assumption.

Conservation status. Data Deficient (Vinarski 2011b).

Ecrobia maritima (Milaschewitch, 1916)

*1916 *Hydrobia maritima* Milaschewitch: 60–61, pl. 2, fig. 34.
1973 *Hydrobia pontieuxini* Radoman: 15–16.

1977 *Ventrosia pontieuxini* (Radoman, 1973). – Radoman: 210, pl. 21, figs 19, 20.
1992 *Pseudopaludinella cygnea* Anistratenko in Anistratenko and Prisjazhnjuk: 17, fig. 1a.
1992 *Pseudopaludinella inflata* Anistratenko in Anistratenko and Prisjazhnjuk: 17–18, fig. 1b.
1992 *Pseudopaludinella ismailensis* Anistratenko in Anistratenko and Prisjazhnjuk: 18, fig. 1c.
2011 *Pseudopaludinella pontieuxini* (Radoman, 1973). – Anistratenko et al.: 78, pl. 3, fig. 4.
2015 *Graecoanatolica yildirimi* Glöer and Pešić: 49–50, figs 10–14.

Status. Accepted, Pontocaspian species.

Type locality. Black Sea, at Feodosiya and Adler (Crimea, Ukraine).

Distribution. Black Sea Basin; northern Aegean Sea; Lake Sarikum, Turkey; northern Adriatic Sea.

Taxonomic notes. *Hydrobia pontieuxini*, described from the Black Sea coast in Mangalia, Romania, has been considered a synonym of *E. maritima* based on molecular data (Kevrekidis et al. 2005). Herein, we also consider the *Pseudopaludinella* species introduced by Anistratenko and Prisjazhnjuk (1992) as junior synonyms of *E. maritima* based on morphological similarities. A proper revision is still pending.

Conservation status. Not assessed.

Ecrobia ventrosa (Montagu, 1803)

*1803 *Turbo ventrosus* Montagu: 317, pl. 12, fig. 13.
2012 *Ecrobia ventrosa* (Montagu, 1803). – Kadolsky: 69–70.
2012 *Hydrobia ventrosa* (Montagu, 1803). – Welter-Schultes: 40, unnumbered text figures.

Status. Accepted, immigrant species.

Type locality. On the Kent coast (United Kingdom), at Folkstone and Sandwich.

Distribution. Widespread along the coastal zones of northern and western Europe, the Mediterranean Sea, the Russia White Sea; introduced into the western Black Sea.

Taxonomic notes. Unpublished genetic data (TW) suggest that most previous records of *E. ventrosa* in the Black Sea are likely misidentifications of *E. grimmi*. A notable exception is a recent, genetically confirmed record from Constanța, Romania (Osikowski et al. 2016). Probably, the French species *Paludestrina arenarum* Bourguignat, 1876, *P. leneumicra* Bourguignat, 1876, *P. paludinelliformis* Bourguignat, 1876, and *Ventrosia cissana* Radoman, 1977, which have been listed for the Black Sea Basin (Anistratenko 1991, Anistratenko and Prisjazhnjuk 1992, Anistratenko et al. 2011), are junior synonyms or misidentifications of this species.

Conservation status. Least Concern (Van Damme 2011a).

Subfamily Pyrgulinae Brusina, 1882

Remarks. The genus concepts of Pontocaspian Pyrgulinae follow the revision of Neubauer et al. (2018). Further change is expected in several of the keeled species here

listed under ?*Turricaspia* (?*T. aenigma*, ?*T. basalis*, ?*T. dimidiata*, ?*T. pseudobacuana*, and ?*T. pseudodimiata*) that may be grouped in their own genus for which the name *Trachycaspia* Dybowski & Grochmalicki, 1917 (type species: *Rissoa dimidiata* Eichwald, 1838) is available. However, such a decision will require further documentation.

Clessiniola variabilis **(Eichwald, 1838)**

*1838 *Paludina variabilis* Eichwald: 151–152.
1838 *Paludina Triton* Eichwald: 152.
1874 *Bithynia*? *Eichwaldi* Martens: 81.
?1887 *Caspia Grimmi* Clessin and Dybowski in Dybowski: 39
?1888 [*Caspia*] *Grimmi* n. sp. – Dybowski: 79, pl. 3, fig. 5a, b.
1887 *Clessinia Martensii* Clessin and Dybowski in Dybowski: 43.
1888 *Clessinia Martensii* n. sp. – Dybowski: 79, pl. 2, fig. 5.
1902a *Clessinia ahngeri* Westerlund: 45–46.
1966 *P.*[*yrgula*] (*Clessiniola*) *pseudotriton* Golikov and Starobogatov: 356–357, fig. 2(3
?1969 *Pyrgula* (*Caspiella*) *derbentina* Logvinenko and Starobogatov: 374, fig. 366(8).
1969 *Pyrgula* (*Caspiella*) *ovum* Logvinenko and Starobogatov: 374, fig. 366(9).
1969 *Pyrgula* (*Caspiella*) *trivialis* Logvinenko and Starobogatov: 374–375, fig. 366(10).
1987 *Turricaspia* (*Clessiniola*) *variabilis* (Eichwald, 1838). – Alexenko and Starobogatov: 34, text fig. 5.
1987 *Turricaspia* (*Clessiniola*) *triton* (Eichwald, 1838). – Alexenko and Starobogatov: 34, text fig. 3.
1987 *Turricaspia* (*Clessiniola*) *martensii* (Clessin & Dybowski in Dybowski, 1888). – Alexenko and Starobogatov: 34, text fig. 4.
1987 *Turricaspia* (*Clessiniola*) *bogensis* (Küster, 1852). – Alexenko and Starobogatov: 34.
2006 *Turricaspia variabilis* (Eichwald, 1838). – Kantor and Sysoev: 111, pl. 49, fig. J.
2011 *Turricaspia martensii* (Clessin & W. Dybowski in W. Dybowski, 1888). – Anistratenko et al.: 86, fig. 3(17).
2011 *Turricaspia triton* (Eichwald, 1838). – Anistratenko et al.: 85–86, fig. 3(16).
2011 *Turricaspia variabilis* (Eichwald, 1838). – Anistratenko et al.: 85, fig. 3(15).
2014 *Turricaspia variabilis*. – Taviani et al.: 4, fig. 3b.
?2016 *Turricaspia derbentina* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 247.
2016 *Turricaspia martensii* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 248.
2016 *Turricaspia ovum* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 248–249.
2016 *Turricaspia pseudotriton* (Golikov & Starobogatov, 1966). – Vinarski and Kantor: 249.
2016 *Turricaspia triton* (Eichwald, 1838). – Vinarski and Kantor: 250.
2016 *Turricaspia trivialis* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 250–251.
2016 *Turricaspia variabilis* (Eichwald, 1838).– Vinarski and Kantor: 251.
2018 *Clessiniola variabilis* (Eichwald, 1838). – Neubauer et al.: 60–63, fig. 7A–I.

Status. Accepted Pontocaspian species.

Type locality. At the Volga River mouth near Astrakhan, and towards the Caspian Sea; also in recently lithified fossil limestone at the shores of Dagestan, Russia.

Distribution. Caspian Sea, Azov Sea, and northern Black Sea region. This species was mentioned in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia variabilis, T. derbentica,* and *T. trivialis*).

Taxonomic notes. Neubauer et al. (2018) recently demonstrated the high variability of this species. Comparison of available illustrations and descriptions of the species listed in the synonymy list indicates that all of them range within this species' variability. Consequently, we consider all of them as junior synonyms of *C. variabilis*. A more in-depth review of the type material of the species involved is required to confirm this approach.

The status of *Paludina bogensis* Dubois in Küster, 1852, which was listed as a valid species of *Turricaspia* by Anistratenko and Stadnichenko (1995), is still unclear. That species was described from the Zapadnyi Bug River in Poland and closely resembles *C. variabilis*. It is, however, unlikely that a Pontocaspian species typical of oligohaline conditions occurs so far away in a pure freshwater environment. "*Paludina eichwaldi* Krynicki, 1837" found in the literature is a nomen nudum. Martens (1874) provided measurements and made the name available, but he listed *Paludina variabilis* Eichwald, 1838 in synonymy, which has priority. Dybowski (1887) obviously overlooked this and considered *Nematurella eichwaldi* Krynicki a valid species. We follow Vinarski and Kantor (2016) and consider the species as a junior synonym of *Clessiniola variabilis*.

Conservation status. Least Concern (Cioboiu et al. 2011).

Laevicaspia abichi (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Caspiella*) *abichi* Logvinenko & Starobogatov: 372, fig. 366(3).
2016 *Pyrgula abichi* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 235.

Status. Accepted Pontocaspian species.

Type locality. Southern and western parts of the Middle Caspian Sea, 36–120 m.

Distribution. Middle and South Caspian Basin. This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia abichi*).

Taxonomic notes. The species differs from the *L. cincta* in its much larger size, the conical shape, the narrower subsutural band, and the larger aperture (compare Neubauer et al. 2018).

Conservation status. Data Deficient (Vinarski 2011e).

Laevicaspia caspia (Eichwald, 1838)

*1838 *Rissoa caspia* Eichwald: 154–155.
non 1888 *Micr.*[*omelania*] *caspia* Eichw. sp. – Dybowski: 78, pl. 1, fig. 1.

?1896 *B.*[*uliminus*] (*Napaeus*?) *goebeli* Westerlund: 188.
1915 *Micromelania* (?) *curta* Nalivkin: 21–22, 31, pl. 6, figs 1, 2 [pars, non figs 3, 4, 7, 9–14].
1915 [*Micromelania* (?) *curta*] var. *plano-convexa* Nalivkin: 22, 31, pl. 6, figs 15–18.
non 1915 *Micromelania caspia* Eichw. – Nalivkin: 22, 31, pl. 6, figs 5, 6 [pars, non fig. 8].
non 1917 *Micromelania* (*Turricaspia, Laevicaspia*) *caspia* Eichw. – Dybowski and Grochmalicki: 5–8, 36–38, pl. 1, figs 1–3.
non 1969 *Pyrgula caspia* (Eichw.). – Logvinenko and Starobogatov: 369–370, fig. 364(1).
2006 *Turricaspia caspia* (Eichwald, 1838). – Kantor and Sysoev: 106, pl. 49, fig. M.
2016 *Turricaspia caspia* (Eichwald, 1838). – Vinarski and Kantor: 246.
2018 *Laevicaspia caspia* (Eichwald, 1838). – Neubauer et al.: 63–66, fig. 8A–K [and synonyms therein].

Status. Accepted Pontocaspian species.

Type locality. In fossil limestone of Dagestan, Russia.

Distribution. Endemic to the Caspian Sea. This species was mentioned from depths between 200 and 500 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia caspia* and *T. curta*).

Taxonomic notes. For a detailed discussion about the identity of this species, its synonyms and former misidentifications, see Neubauer et al. (2018).

Conservation status. IUCN indicates "Least Concern" (Vinarski 2012), but the true status of this species is highly uncertain.

Laevicaspia cincta (Abich, 1859)

*1859 *Rissoa cincta* Abich: 57, pl. 2, fig. 6.
?1887 *Caspia Orthii* Clessin & Dybowski in Dybowski: 40.
?1888 [*Caspia*] *Orthii* n. sp. – Dybowski: 79, pl. 3, fig. 6.
1969 *Pyrgula* (*Caspiella*) *cincta* (Abich). – Logvinenko and Starobogatov: 372, fig. 366(4).
2006 *Pyrgula cincta* (Abich, 1859). – Kantor and Sysoev: 98, pl. 47, fig. L.
2016 *Pyrgula cincta* (Abich, 1859). – Vinarski and Kantor: 236–237.
2018 *Laevicaspia cincta* (Abich, 1859). – Neubauer et al.: 66–68, fig. 9A–H.

Status. Accepted Pontocaspian species.

Type locality. Gulf of Baku, Azerbaijan.

Distribution. Southern Caspian Sea (Logvinenko and Starobogatov 1969).

Taxonomic notes. For a detailed discussion about the identity of this species and its synonym, see Neubauer et al. (2018).

Conservation status. Data Deficient (Vinarski 2011g).

Laevicaspia conus (Eichwald, 1838)

*1838 *Rissoa Conus* Eichwald: 155.

non 1876 *Eulima conus*, Eichw?. – Grimm: 154–156, pl. 6, fig. 14.
non 2006 *Turricaspia conus conus* (Eichwald, 1838). – Kantor and Sysoev: 106, pl. 48, fig. J.
2016 *Turricaspia conus conus* (Eichwald, 1838). – Vinarski and Kantor: 246–247.
2018 *Laevicaspia conus* (Eichwald, 1838). – Neubauer et al.: 69–71, fig. 9I–P [and synonyms therein].

Status. Accepted Pontocaspian species.

Type locality. In fossil limestone of Dagestan, Russia.

Distribution. Endemic to the Caspian Sea (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia conus*).

Taxonomic notes. For a detailed discussion about the identity of this polymorphic species and previous misidentifications, see Neubauer et al. (2018).

Conservation status. Data Deficient (Vinarski 2011p).

?*Laevicaspia ebersini* (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Oxypyrgula*) *ebersini* Logvinenko & Starobogatov: 368, fig. 363(7).
2016 *Pyrgula ebersini* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 238.

Status. Pontocaspian species, identity uncertain.

Type locality. Western part of the middle Caspian Sea, 0–50 m water depth.

Distribution. Type locality only.

Taxonomic notes. We cannot verify the status of this species given the inadequate descriptions and illustrations and its general resemblance to other species that were described earlier.

Conservation status. Data Deficient (Vinarski 2011h).

?*Laevicaspia ismailensis* (Golikov & Starobogatov, 1966)

*1966 *P.*[*yrgula*] *ismailensis* Golikov & Starobogatov: 358, fig. 2(11).
2006 *Turricaspia ismailensis* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 108, pl. 50, fig. A.
2016 *Turricaspia ismailensis* (Golikov & Starobogatov, 1966). – Vinarski and Kantor: 248.

Status. Accepted Pontocaspian species.

Type locality. Ukraine, Danube Delta, lakes Yalpug and Kugurlui.

Distribution. North-western Black Sea Basin (Anistratenko and Stadnichenko 1995).

Taxonomic notes. Based on the illustration of the holotype in Kantor and Sysoev (2006), we tentatively place the species in the genus *Laevicaspia*. A more detailed study is necessary to clarify its systematic position.

Conservation status. Vulnerable (Son and Cioboiu 2011).

Laevicaspia kolesnikoviana (Logvinenko & Starobogatov in Golikov & Starobogatov, 1966)

*1966 *P.*[*yrgula*] (*Caspiella*) *kolesnikoviana* Golikov & Starobogatov: 357–358, fig. 2(8–9).
1969 *Pyrgula* [(*Caspiella*)] *kolesnikoviana* Logv. & Star. – Logvinenko and Starobogatov: 372, fig. 366(1).
2006 *Pyrgula kolesnikoviana* Logvinenko & Starobogatov in Golikov & Starobogatov, 1966. – Kantor and Sysoev: 100, pl. 47, fig. N.
2016 *Pyrgula kolesnikoviana* Logvinenko & Starobogatov in Golikov & Starobogatov, 1966. – Vinarski and Kantor: 239.
2018 *Laevicaspia kolesnikoviana* (Logvinenko & Starobogatov in Golikov & Starobogatov, 1966). – Neubauer et al.: 71–73, fig. 10A–E, K, N.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea, northward of Apsheron Peninsula, north-westward from Kamni Dva Brata Island, 40°47'N, 49°42'E, 30 m water depth.

Distribution. Endemic to the Caspian Sea. This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia kolesnikoviana*).

Taxonomic notes. For a detailed discussion about the identity of this species, see Neubauer et al. (2018).

Conservation status. Data Deficient (Vinarski 2011k).

Laevicaspia kowalewskii (Clessin & Dybowski in Dybowski, 1887)

*1887 *Caspia Kowalewskii* Clessin & Dybowski in Dybowski: 40–41.
1888 [*Caspia*] *Kowalewskii* n. sp. – Dybowski: 79, pl. 3, fig. 9a–c.
2006 *Pyrgula kowalewskii* (Clessin & W. Dybowski in W. Dybowski, 1888). – Kantor and Sysoev: 100, pl. 47, fig. M.
2016 *Pyrgula kowalewskii* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 239–240.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Caspian Sea, recorded from southern basin (Logvinenko and Starobogatov 1969) and middle basin (personal observation based on material from Dagestan region, TAN, FW). This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia kowalewskii*).

Taxonomic notes. This species differs from *L. kolesnikoviana* in its bigger size, broader shape, and thinner peristome. *Laevicaspia cincta* can be distinguished based on the stouter shape and the presence of a narrow subsutural band.

Conservation status. Not assessed.

Laevicaspia lencoranica (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Eurycaspia*) *lencoranica* Logvinenko & Starobogatov: 357, fig. 358(14).
2016 *Pyrgula lencoranica* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 240.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea (no details).

Distribution. Caspian Sea (Logvinenko and Starobogatov 1969).

Taxonomic notes. Based on the illustrations provided in Kantor and Sysoev (2006), this species differs from *L. cincta* and *L. kowalewskii* in the conical shape and large body whorl. A revision is required to assure its status as distinct species.

Conservation status. Not assessed.

Laevicaspia lincta (Milaschewitch, 1908)

*1908 *Micromelania lincta* Milaschewitch: 991.
?1966 *P.*[*yrgula*] (*Caspiella*) *azovica* Golikov and Starobogatov: 357, fig. 2(7).
?1966 *P.*[*yrgula*] (*Caspiella*) *boltovskoji* Golikov and Starobogatov: 357, fig. 2(4).
?1966 *P.*[*yrgula*] (*Caspiella*) *crimeana* Golikov and Starobogatov: 358, fig. 2(10).
?1966 *P.*[*yrgula*] (*Caspiella*) *limanica* Golikov and Starobogatov: 357, fig. 2(6).
?1966 *P.*[*yrgula*] (*Caspiella*) *lindholmiana* Golikov and Starobogatov: 357, fig. 2(5).
?1966 *P.*[*yrgula*] (*Laevicaspia*) *iljinae* Golikov and Starobogatov: 358–359, fig. 2(14).
?1966 *P.*[*yrgula*] (*Laevicaspia*) *milachevitchi* Golikov and Starobogatov: 359, fig. 2(15).
?1966 *P.*[*yrgula*] (*Laevicaspia*) *ostroumovi* Golikov and Starobogatov: 358, fig. 2(13).
?1966 *P.*[*yrgula*] (*Turricaspia*) *borceana* Golikov and Starobogatov: 359, fig. 2(16).
?1966 *P.*[*yrgula*] (*Turricaspia*) *nevesskae* Golikov and Starobogatov: 359, fig. 2(17).
?1987 *Turricaspia abichi phaseolinica* Alexenko and Starobogatov: 33.
?1987 *Turricaspia* (*Caspiella*) *derbentina borysthenica* Alexenko adn Starobogatov: 34–35, fig. 6.
?1987 *Turricaspia* (*Laevicaspia*) *grigorievi* Alexenko and Starobogatov: 35, fig. 7.
?1987 *Turricaspia* (*Laevicaspia*) *meneghiniana ukrainica* Alexenko and Starobogatov: 35, fig. 9.
?2006 *Euxinipyrgula azovica* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 95, pl. 44, fig. K.
?2006 *Euxinipyrgula borysthenica* (Alexenko & Starobogatov, 1987). – Kantor and Sysoev: 95, pl. 44, fig. J.
?2006 *Euxinipyrgula grigorievi* (Alexenko & Starobogatov, 1987). – Kantor and Sysoev: 95, pl. 44, fig. I.
?2006 *Euxinipyrgula limanica* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 95, pl. 44, fig. H.
2006 *Euxinipyrgula lincta* (Milaschewitsch, 1908). – Kantor and Sysoev: 95–96, pl. 45, fig. D.
?2006 *Euxinipyrgula milachevitchi* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 96, pl. 45, fig. C.
?2006 *Euxinipyrgula ostroumovi* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 96, pl. 45, fig. B.

?2006 *Euxinipyrgula ukrainica* (Alexenko & Starobogatov, 1987). – Kantor and Sysoev: 95, pl. 45, fig. A.
?2006 *Turricaspia boltovskoji* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 105–106, pl. 48, fig. K.
?2006 *Turricaspia borceana* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 106, pl. 49, fig. B.
?2006 *Turricaspia conus lindholmiana* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 107, pl. 48, fig. L.
?2006 *Turricaspia crimeana* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 107, pl. 48, fig. C.
?2006 *Turricaspia iljinae* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 108, pl. 49, fig. D.
?2006 *Turricaspia nevesskae* (Golikov & Starobogatov, 1966). – Kantor and Sysoev: 109, pl. 49, fig. L.

Status. Accepted Pontocaspian species.

Type locality. Kotlabukh Lake, Odessa Region, Ukraine (approximately 45°25'35"N, 28°59'41"E).

Distribution. Limans and lower reaches of rivers Don, Dnieper, Dniester, and Southern Bug entering the northern Black Sea Basin and the Azov Sea (Taganrog Bay), as well as in coastal lakes Kotlabukh and Yalpug (Vinarski and Kantor 2016). The record of an undescribed subspecies of *T. boltovskoji* from the Caspian Sea mentioned by Anistratenko and Stadnichenko (1995) is probably based on a misidentification.

Taxonomic notes. Golikov and Starobogatov (1966) and Alexenko and Starobogatov (1987) introduced a plethora of names for morphologically similar species from the northern Black Sea Basin, partly deriving from subfossil horizons. They differ from *Laevicaspia lincta* slightly in the number of whorls and outline shape, but overall range within its morphological variability. Here, we consider them tentatively all junior synonyms of *L. lincta*. Since Starobogatov's type material is unknown, support for this approach requires collection of new material from the type localities of these taxa. Molecular data confirmed the conspecifity of *L. lincta* and *L. milachevitchi* (Wilke et al. 2007).

Conservation status. Least Concern (Son 2011e).

?*Laevicaspia marginata* (Westerlund, 1902)

*1902a *Nematurella marginata* Westerlund: 45.
2013 *Pyrgula marginata* (Westerlund, 1902). – Vinarski et al.: 85, fig. 2F.
2016 *Pyrgula marginata* (Westerlund, 1902). – Vinarski and Kantor: 240.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea, "near Krasnojarsk" (Westerlund 1902a). This statement is clearly erroneous since Krasnojarsk is situated in Siberia. Most probably, Westerlund meant Krasnovodsk (nowadays Turkmenbashi) in Turkmenistan (Vinarski et al. 2013).

Distribution. Endemic to the Caspian Sea. This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia marginata*).

Taxonomic notes. The status of this species is uncertain. The illustrations of the type material by Vinarski et al. (2013) suggest a tentative placement in the genus *Laevicaspia*. It shows close similarities with *L. sieversii* (Clessin in Dybowski, 1887). A careful revision of the species is required to clarify its taxonomic status and systematic placement.

Conservation status. Not assessed.

Laevicaspia sieversii (Clessin in Dybowski, 1887)

*1887 *Nematurella Sieversii* Clessin in Dybowski: 45–46.
1888 *Nematurella Sieversi* [sic] n. sp. – Dybowski: 78, pl. 2, fig. 1.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea.

Taxonomic notes. This species has not been found since its first description, its identity is unclear (Vinarski and Kantor 2016). Judging from the description and drawing in Dybowski (1887), we suggest a systematic placement in *Laevicaspia*. It might be related to *L. conus* (Eichwald, 1838).

Conservation status. Not assessed.

?*Turricaspia aenigma* (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Celekenia*) *aenigma* Logvinenko & Starobogatov: 375, fig. 366(12).
2016 *Pyrgula aenigma* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 235.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea, northward of Apsheron Peninsula, 75 m.

Distribution. Type locality only.

Taxonomic notes. The identity of this species is unclear. The illustrations of the holotype in Kantor and Sysoev (2006) show a small shell with four whorls, of which the latter two bear a distinct keel. The small size and the relatively large protoconch suggest that the type specimen is a juvenile shell. More specimens (including adult material) are required to shed light on this species' identity.

Conservation status. Not assessed.

Turricaspia andrussowi (Dybowski & Grochmalicki, 1915)

*1915 *Micromelania* (*Turricaspia*) *andrussowi* Dybowski & Grochmalicki: 125–126, pl. 3, fig. 31a, b.
?1969 *Pyrgula* (*Oxypyrgula*) *dubia* Logvinenko and Starobogatov: 368, fig. 363(5).

?1969 *Pyrgula* (*Oxypyrgula*) *turkmenica* Logvinenko and Starobogatov: 368, fig. 363(6).
2006 *Turricaspia andrussowi* (B. Dybowski & Grochmalicki, 1915). – Kantor and Sysoev: 104–105, pl. 48, fig. A [pars, excluding synonymy].
2016 *Turricaspia andrussowi* (B. Dybowski & Grochmalicki, 1915). – Vinarski and Kantor: 245 [pars, excluding synonymy].
2018 *Turricaspia andrussowi* (B. Dybowski & Grochmalicki, 1915). – Neubauer et al.: 74–76, fig. 11A, BB.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea. The two tentative synonyms were recorded from the western part of the middle Caspian Sea and the eastern part of the southern Caspian Sea, respectively. This species was mentioned from depths between 200 and 500 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *T. turkmenica*, *T. dubia*, and *T. andrussowi*).

Taxonomic notes. The species was recently investigated by Neubauer et al. (2018). *Pyrgula dubia* and *P. turkmenica* are tentatively considered juveniles and thus junior synonyms of this species.

Conservation status. Not assessed.

?*Turricaspia basalis* (Dybowski & Grochmalicki, 1915)

*1915 *Micromelania dimidiata* var. *basalis* Dybowski & Grochmalicki: 131, pl. 3, fig. 36a, b.
1969 *Pyrgula* (*Trachycaspia*) *laticarinata* Logvinenko and Starobogatov: 359, fig. 359(3).
2006 *Pyrgula basalis basalis* (B. Dybowski & J. Grochmalicki, 1915). – Kantor and Sysoev: 97, pl. 46, fig. A.
2006 *Pyrgula basalis laticarinata* Logvinenko & Starobogatov, 1968. – Kantor and Sysoev: 97, pl. 46, fig. B.
2016 *Pyrgula basalis basalis* (B. Dybowski & Grochmalicki, 1915). – Vinarski and Kantor: 236.
2016 *Pyrgula basalis laticarinata* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 236.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea (no details).

Distribution. Middle and southern Caspian Sea (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *T. laticarinata*).

Taxonomic notes. The species is characterised by a massive keel near the lower suture. ?*Turricaspia dimidiata* is distinguished based on its more centrally placed keel. This distinction is tentative and only based on comparison of available illustrations; we are aware of the possibility that these differences might not be diagnostic. Moreover, the keel seems to become stronger with increasing water depth (Starobogatov 1968).

Pyrgula laticarinata Logvinenko & Starobogatov, 1969, which differs from *T. basalis* only in the strength of the keels, was considered a junior synonym by Neubauer et al. (2018).

Conservation status. Not assessed.

?*Turricaspia bogatscheviana* (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Oxypyrgula*) *bogatscheviana* Logvinenko & Starobogatov: 367, fig. 363(2).
2016 *Turricaspia bogatscheviana* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 245.

Status. Pontocaspian species, identity uncertain.

Type locality. Western part of the Caspian Sea.

Distribution. Type locality only.

Taxonomic notes. The description and drawing of this species provided by Logvinenko and Starobogatov (1969) do not allow an evaluation whether it is a distinct species or synonym of a previously species.

Conservation status. Not assessed.

Turricaspia chersonica Alexenko & Starobogatov, 1987

*1987 *Turricaspia* (*Oxypyrgula*) *chersonica* Alexenko & Starobogatov: 35–36, fig. 10.
2016 *Turricaspia chersonica* Alexenko & Starobogatov, 1987. – Vinarski and Kantor: 246.

Status. Pontocaspian species, identity uncertain.

Type locality. Ukraine, in the Dnieper Delta.

Distribution. Type locality only.

Taxonomic notes. The status of this species is highly uncertain. The slender conical shell illustrated by Alexenko and Starobogatov (1987) suggest classification in the genus *Turricaspia*, which is otherwise only known from the Caspian Sea.

Conservation status. Data Deficient (Son 2011d).

Turricaspia columna (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Oxypyrgula*) *columna* Logvinenko & Starobogatov: 368, fig. 363(8).
2016 *Pyrgula columna* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 237.

Status. Pontocaspian species, identity uncertain.

Type locality. Western part of the southern Caspian Sea.

Distribution. Type locality only.

Taxonomic notes. The species has not been found since its first description, and the whereabouts of the type material is unknown. Logvinenko and Starobogatov (1969) illustrate a small slender shell with convex whorls. It might well be a juvenile of another species.

Conservation status. Not assessed.

Turricaspia concinna (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Turricaspia*) *concinna* Logvinenko & Starobogatov: 365, fig. 362(3).
2016 *Pyrgula concinna* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 237.

Status. Pontocaspian species, identity uncertain.

Type locality. Middle Caspian Sea, 25–80 m.

Distribution. Type locality only.

Taxonomic notes. The illustrations provided by Logvinenko and Starobogatov (1969) indicate a large conical shell with nine convex whorls and a large, slightly inflated last whorl. These features are reminiscent of *T. meneghiniana* (Issel, 1865). However, *T. concinna* has not been found since its first description. The type material has been very recently detected in the collections of ZIN and awaits further study.

Conservation status. Not assessed.

Turricaspia dagestanica (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Turricaspia*) *dagestanica* Logvinenko & Starobogatov: 361, fig. 360(3).
2016 *Turricaspia dagestanica* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 247.

Status. Pontocaspian species, identity uncertain.

Type locality. Western shore of the middle Caspian Sea.

Distribution. Middle and south Basin of Caspian Sea. This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The status of this species is highly uncertain. The illustrations of Logvinenko and Starobogatov (1969) show a slightly distorted shell with weakly convex whorls and a thin line below the suture. We are uncertain whether it might concern a growth aberration of a more common species.

Conservation status. Data Deficient (Vinarski 2011r).

Turricaspia dimidiata (Eichwald, 1838)

*1838 *Rissoa dimidiata* Eichwald: 156.
?1947 *Turricaspia bakuana* Kolesnikov: 108, 112.
2006 *Pyrgula dimidiata* (Eichwald, 1838). – Kantor and Sysoev: 99, pl. 46, fig. K.
?2006 *Pyrgula bakuana* (Kolesnikov, 1947). – Kantor and Sysoev: 97, pl. 47, fig. C.
2016 *Pyrgula dimidiata* (Eichwald, 1838). – Vinarski and Kantor: 238.
2016 *Pyrgula bakuana* (Kolesnikov, 1947). – Vinarski and Kantor: 236–237.

Status. Accepted Pontocaspian species.

Type locality. In fossil limestone of Dagestan, Russia.

Distribution. Middle and southern Caspian Sea (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 500 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. Although there is little doubt about the validity of this species, its true identity and possible synonyms are unclear. Eichwald's (1838) description clearly indicates a slender shell with median keel. His type material is unfortunately unknown. The high number of keeled species complicates an evaluation what is the "true" *T. dimidiata* and what are synonyms. We tentatively consider *Turricaspia bakuana* Kolesnikov, 1947 a junior synonym of this species, based on its slender shell with median keel matching Eichwald's description as well as the prevailing concept of *T. dimidiata* (compare Kantor and Sysoev 2006). More data are required to support this view.

Conservation status. Not assessed.

Turricaspia eburnea (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Laevicaspia*) *eburnea* Logvinenko & Starobogatov: 370, fig. 365(1).
2016 *Turricaspia eburnea* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 247.

Status. Pontocaspian species, identity uncertain.

Type locality. Eastern part of the southern Caspian Sea.

Distribution. South Caspian Basin. This species was mentioned from depths between 200 and 500 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The identity of this species is unclear. Its shell resembles *T. lyrata* (Dybowski & Grochmalicki, 1915) in terms of general shape and the large, flat protoconch; it differs from that species in the large size. The type material has been very recently found in the collection of ZIN and awaits further study. Until then, we refrain from a final decision on the species' status, but we have severe doubt that *Pyrgula eburnea* is a distinct species.

Conservation status. Not assessed.

Turricaspia elegantula (Clessin & Dybowski in Dybowski, 1887)

*1887 *Micromelania elegantula* Clessin & Dybowski in Dybowski: 33.
1888 [*Micromelania*] *elegantula* n. sp. – Dybowski: 78, pl. 1, fig. 7a–c.
2016 *Turricaspia elegantula* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 247–248.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea. This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. There is considerable confusion about the identity of this species. Dybowski (1887) described and illustrated a very slender shell with a distinct

whorl profile showing a straight-sided upper half and a convex lower half. In contrast, the illustrations in Logvinenko and Starobogatov (1969) suggest a similarly slender yet distorted shell with near almost sided whorls and expanded aperture. A restudy of the type material of *T. elegantula* show close similarities to *T. spica*. It differs from that species in the more slender outline and flattened whorls.

Conservation status. Not assessed.

Turricaspia eulimellula (Dybowski & Grochmalicki, 1915)

*1915 *Micromelania* (*Turricaspia*) *eulimellula* Dybowski & Grochmalicki: 123–125, pl. 3, fig. 27a, b.
2006 *Pyrgula eulimellula* (B. Dybowski & J. Grochmalicki, 1915). – Kantor and Sysoev: 99–100, pl. 46, fig. L.
2016 *Pyrgula eulimellula* (B. Dybowski & Grochmalicki, 1915). – Vinarski and Kantor: 238–239.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Middle Caspian Sea Basin (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The nearly straight-sided, strongly attached whorls easily distinguish this species from most other *Turricaspia* species. Only *Turricaspia grimmi* (Clessin & Dybowski in Dybowski, 1887) has a similar whorl arrangement, but its shell is slightly wider and the whorls are weakly stepped and bear a thin subsutural band.

Conservation status. Not assessed.

Turricaspia fedorovi (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Turricaspia*) *fedorovi* Logvinenko & Starobogatov: 362, fig. 360(2).
2016 *Pyrgula fedorovi* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 239.

Status. Pontocaspian species, identity uncertain.

Type locality. Western part of the middle Caspian Sea, 80 m.

Distribution. Middle and South Caspian Basin. This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The slender elongate shell with whorls slowly increasing in height distinguishes this species from its congeners. However, a proper assessment of the species' status requires investigation. The whereabouts of the type material is unknown and no other records of this species are known, so we are not able to verify the status of this species.

Conservation status. Not assessed.

Turricaspia grimmi (Clessin & Dybowski in Dybowski, 1887)

*1887 *Micromelania Grimmi* Clessin & Dybowski in Dybowski: 27–29.
1888 [*Micromelania*] *Grimmi* n. sp. – Dybowski: 78, pl. 1, fig. 2a–c.
2006 *Pyrgula grimmi* (Clessin & W. Dybowski in W. Dybowski, 1888). – Kantor and Sysoev: 100, pl. 46, fig. L.
2016 *Pyrgula grimmi* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 239.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Southern Caspian Sea Basin (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The peculiar morphology with straight-sided, weakly stepped whorls with a thin subsutural band is unique among Caspian Pyrgulinae. See above for a comparison with *T. eulimellula*.

Conservation status. Data Deficient (Vinarski 2011i).

Turricaspia lyrata (Dybowski & Grochmalicki, 1915)

*1915 *Micromelania* (*Turricaspia*) *spica* var. *lyrata* Dybowski & Grochmalicki: 117, pl. 2, fig. 18.
2006 *Pyrgula lirata* [sic] (B. Dybowski & J. Grochmalicki, 1915). – Kantor and Sysoev: 101, pl. 46, fig. E.
2016 *Pyrgula lirata* [sic] (B. Dybowski & Grochmalicki, 1915). – Vinarski and Kantor: 240.
2018 *Turricaspia lyrata* (B. Dybowski & Grochmalicki, 1915). – Neubauer et al.: 77–79, fig. 12A–K [and synonyms therein].

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea (after Logvinenko and Starobogatov 1969); it occurs in the western part of the middle and southern Caspian Sea basins, but these authors used a slightly different concept of the species. This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Turricaspia lirata*).

Taxonomic notes. See Neubauer et al. (2018) for a detailed discussion of the species and its synonyms.

Conservation status. Not assessed.

Turricaspia marisnigri Starobogatov in Alexenko & Starobogatov, 1987

*1987 *Turricaspia lirata marisnigri* Starobogatov in Alexenko & Starobogatov: 33.

Status. Pontocaspian species, identity uncertain.

Type locality. "Meotida" station 24, sample 229, near the coast of Crimea, in phaseoline silt (Holocene).

Distribution. Type locality only.

Taxonomic notes. The species can be distinguished based on its extremely slender shell with whorls slowly increasing in size. Still, clarification of its identity as well as its generic classification requires investigation of additional material.

Conservation status. So far only known from Holocene deposits of the type locality; species might be extinct. Within Holocene deposits in the Black Sea small amounts of reworked Late Pleistocene "Neoeuxinian" faunas are found (FW, pers. obs.), and therefore the stratigraphic origin of such Pontocaspian species is uncertain.

Turricaspia meneghiniana (Issel, 1865)

*1865 *Bythinia Meneghiniana* Issel: 21, pl. 1, figs 12, 13.
1902a *Micromelania subulata* Westerlund: 47.
?1969 *Pyrgula caspia* (Eichw). – Logvinenko and Starobogatov: 369–370, fig. 364(1) [**non** *Rissoa caspia* Eichwald, 1838].
non 1987 *T.*[*urricaspia*] *meneghiniana meneghiniana* (Iss.). – Alexenko and Starobogatov: 35, fig. 8.
2006 *Turricaspia meneghiniana* (Issel, 1865). – Kantor and Sysoev: 109, pl. 49, fig. E.
2016 *Turricaspia meneghiniana* (Issel, 1865). – Vinarski and Kantor: 248.
2018 *Turricaspia meneghiniana* (Issel, 1865). – Neubauer et al.: 79–81, fig. 13A–K [and synonyms therein].

Status. Accepted Pontocaspian species.

Type locality. Baku, Azerbaijan; (sub?)fossil.

Distribution. Middle and southern Caspian Sea (Logvinenko and Starobogatov 1969).

Taxonomic notes. The species was recently discussed in detail by Neubauer et al. (2018), who also discussed previous misidentifications.

Conservation status. Not assessed.

Turricaspia nossovi Kolesnikov, 1947

*1947 *Turricaspia nossovi* Kolesnikov: 108, 111.
2006 *Pyrgula nossovi* (Kolesnikov, 1947). – Kantor and Sysoev: 101, pl. 45, fig. G.
2016 *Pyrgula nossovi* (Kolesnikov, 1947). – Vinarski and Kantor: 241.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Southern Caspian Sea (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 500 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The very slender shape and the characteristic, highly convex whorls that slowly and regularly increase in height distinguish the species from most congeners. *Pyrgula vinogradovi* Logvinenko & Starobogatov, 1969 and *P. astrachanica* Pirogov, 1971, which show very similar traits, might be junior synonyms. A more in-depth study is required to solve their statuses.

Conservation status. Data Deficient (Vinarski 2011l).

?*Turricaspia obventicia* (Anistratenko in Anistratenko & Prisjazhnjuk, 1992)

*1992 *Caspia* (*Clathrocaspia*) *obventicia* Anistratenko in Anistratenko & Prisjazhnjuk: 19–20, fig. 2b.

Status. Uncertain Pontocaspian species.

Type locality. Well 37 near Kiliya, Izmail district, Odessa region, Ukraine (from Holocene sediments).

Distribution. Type locality only.

Taxonomic notes. This species was originally attributed to the genus *Caspia* due to its small shell. A study of the holotype of this species, specifically its protoconch characteristics, suggest placement in the genus *Turricaspia*. Further studies are required to assure its validity.

Remarks. The species is known only from the holotype. The occurrence of *Turricaspia* in the Black Sea Basin is unusual, as almost all other pyrguline Black Sea species are assigned to the genus *Laevicaspia* (but see remark at *T. spica* for another unusual occurrence).

Conservation status. So far only known from Holocene deposits of the type locality; species might be extinct.

?*Turricaspia pseudobacuana* (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Eurycaspia*) *pseudobacuana* Logvinenko & Starobogatov: 358, fig. 358(16).

2016 *Pyrgula pseudobacuana* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 241.

Status. Pontocaspian species, probably junior synonym.

Type locality. Southern Caspian Sea, 50–80 m.

Distribution. South Caspian Basin. This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The slender shell with a keel near the lower suture is reminiscent of *T. basalis* (Dybowski & Grochmalicki, 1915). The short description and

poor drawing precluded the verification of its status. The type material has been very recently detected in the collection of ZIN and awaits further study.

Conservation status. Not assessed.

?*Turricaspia pseudodimidiata* (Dybowski & Grochmalicki, 1915)

*1915 *Micromelania* (*Turricaspia*) *pseudodimidiata* Dybowski & Grochmalicki: 126–128, pl. 3, fig. 32a, b.
?1969 *Pyrgula* (*Eurycaspia*) *pseudodimidiata* (Dyb. et Gr.). – Logvinenko and Starobogatov: 357, fig. 358(15).
?2006 *Pyrgula pseudodimidiata* (B. Dybowski & Grochmalicki, 1915). – Kantor and Sysoev: 102, pl. 47, fig. G.
2016 *Pyrgula pseudodimidiata* (B. Dybowski & Grochmalicki, 1915). – Vinarski and Kantor: 241.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea (no details).

Distribution. Southern Caspian Sea (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The identity of this species is uncertain. Dybowski and Grochmalicki (1915) describe and illustrate a shell with eight convex whorls bearing a weak, hardly protruding, irregular shaped keel near the lower suture. According to these authors, the keel varies considerably between a thin thread, a blunt bulge, or a weak thickening at the suture. In contrast, the drawings provided by Logvinenko and Starobogatov (1969) and reproduced by Kantor and Sysoev (2006) suggest a shell with straight-sided whorls and a distinct keel. Inspection of the type material is required to clarify the status of this species.

Conservation status. Not assessed.

Turricaspia pseudospica (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Oxypyrgula*) *pseudospica* Logvinenko & Starobogatov: 366, fig. 363(1).
2016 *Pyrgula pseudospica* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 241–242.

Status. Pontocaspian species, identity uncertain.

Type locality. Middle and southern Caspian Sea, 15–75 m.

Distribution. Type locality only.

Taxonomic notes. The identity of this species is unclear. Judging from the drawing by Logvinenko and Starobogatov (1969), showing a small slender shell with ca. 6.5 convex whorls, the species might be based on a juvenile specimen. Moreover, it could be a junior synonym of the similarly shaped *T. spica* (Eichwald, 1855).

Conservation status. Not assessed.

Turricaspia pulla (Dybowski & Grochmalicki, 1915)

*1915 *Micromelania* (*Turricaspia*) *caspia* var. *pulla* Dybowski & Grochmalicki: 111, pl. 1, fig. 6a.
1969 *Pyrgula* [(*Turricaspia*)] *pulla* (Dyb. et Gr.). – Logvinenko and Starobogatov: 361–362, fig. 360(8).
2006 *Pyrgula pulla* (B. Dybowski & Grochmalicki, 1915). – Kantor and Sysoev: 102, pl. 46, fig. C.
2016 *Pyrgula pulla* (B. Dybowski & Grochmalicki, 1915). – Vinarski and Kantor: 242.
2018 *Turricaspia pulla* (B. Dybowski & Grochmalicki, 1915). – Neubauer et al.: 81–82, fig. 14A–J.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea, reported from the middle and southern Caspian Sea basins (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The species can be easily distinguished from other *Turricaspia* species based on its relatively broad shell, the low-convex whorls, and its small size (Neubauer et al. 2018).

Conservation status. Data Deficient (Vinarski 2011m).

Turricaspia pullula (Dybowski & Grochmalicki, 1915)

*1915 *Micromelania* (*Turricaspia*) *caspia* var. *pullula* Dybowski & Grochmalicki: 111–112, pl. 1, fig. 7.
1969 *Pyrgula* [(*Turricaspia*)] *pullula* (Dyb. et Gr.). – Logvinenko and Starobogatov: 366–367, fig. 363(3).
2006 *Turricaspia pullula* (B. Dybowski & Grochmalicki, 1915). – Kantor and Sysoev: 109, pl. 50, fig. B.
2016 *Turricaspia pullula* (B. Dybowski & Grochmalicki, 1915). – Vinarski and Kantor: 249.
2018 *Turricaspia pullula* (B. Dybowski & Grochmalicki, 1915). – Neubauer et al.: 82–84, fig. 14K–L.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Endemic to the Caspian Sea, reported from the western part of the middle Caspian Sea (Logvinenko and Starobogatov 1969).

Taxonomic notes. The very characteristic tripartite whorl profile allows an easy identification and discrimination from other Pontocaspian Pyrgulinae (Neubauer et al. 2018).

Conservation status. Data Deficient (Vinarski 2011s).

Turricaspia rudis (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Turricaspia*) *rudis* Logvinenko & Starobogatov: 362, fig. 360(5).
2016 *Pyrgula rudis* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 242.

Status. Pontocaspian species, identity uncertain.

Type locality. Middle and southern Caspian Sea, 50–100 m.

Distribution. Type locality only.

Taxonomic notes. The status of this species is unclear. The drawing provided by Logvinenko and Starobogatov (1969) shows strong similarities to *T. grimmi* in terms of the nearly straight-sided whorls and the large aperture. Since the whereabouts of the type material is unknown, we refrain from a final conclusion on the potential synonymy.

Conservation status. Data Deficient (Vinarski 2011n).

Turricaspia sajenkovae (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Turricaspia*) *sajenkovae* Logvinenko & Starobogatov: 361, fig. 360(4).
2016 *Turricaspia sajenkovae* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 249–250.

Status. Pontocaspian species, identity uncertain.

Type locality. Middle Caspian Sea.

Distribution. Type locality only.

Taxonomic notes. The available drawing of this species suggests a very slender shell with highly convex whorls bearing a subsutural band. The type material has not been found, and the identity of this species remains unclear.

Conservation status. Data Deficient (Vinarski 2011t).

Turricaspia similis (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Caspiella*) *similis* Logvinenko & Starobogatov: 375, fig. 366(11).
2016 *Pyrgula similis* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 243.

Status. Pontocaspian species, identity uncertain.

Type locality. Eastern part of the middle Caspian Sea, 20–50 m.

Distribution. Middle and southern Caspian Basin. This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. Judging from the drawing in Logvinenko and Starobogatov (1969), presenting a small slender shell with ca. 5.5 highly convex whorls, the species might be based on a juvenile specimen. It might be a junior synonym of the similarly shaped *T. meneghiniana* (Issel, 1865). Without investigating the type material, which has not been found in the ZIN collection, the identity of this species remains unclear.

Conservation status. Not assessed.

Turricaspia simplex (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Oxypyrgula*) *simplex* Logvinenko & Starobogatov: 367–368, fig. 363(4).
2016 *Pyrgula simplex* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 243.

Status. Pontocaspian species, identity uncertain.

Type locality. Middle Caspian Sea, 40–120 m.

Distribution. Middle and southern Caspian Sea. This species was mentioned from depths between 200 and 900 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. As for the previous species, it is highly uncertain whether this taxon is a distinct species. It might also be based on a juvenile and could be a synonym of an earlier described species, perhaps *T. pulla* or *T. lyrata*.

Conservation status. Not assessed.

Turricaspia spasskii (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Turricaspia*) *spasskii* Logvinenko & Starobogatov: 361, fig. 360(7).
2016 *Turricaspia spasskii* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 250.

Status. Accepted Pontocaspian species.

Type locality. Western part of the middle Caspian Sea.

Distribution. Middle and southern Caspian Sea. This species was mentioned from depths between 200 and 300 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The fast growing whorls terminating in a large body whorl with expanded aperture are characteristic for this species and facilitate discrimination from other *Turricaspia* species.

Conservation status. Data Deficient (Vinarski 2011u).

Turricaspia spica (Eichwald, 1855)

*1855 *Paludina spica* Eichwald: 303–304, pl. 10, figs 8, 9.
?1992 *Turricaspia spica* (Eichw.). – Anistratenko and Prisjazhnjuk: 18, fig. 2d.
2006 *Turricaspia spica* (Eichwald, 1855). – Kantor and Sysoev: 110, pl. 49, fig. F.
2009 *Turricaspia* cf. *spica* (Eichwald, 1855). – Filippov and Riedel: 70, 72, 74, 76, fig. 4e, f.
2016 *Turricaspia spica* (Eichwald, 1855). – Vinarski and Kantor: 250.

Status. Accepted Pontocaspian species.

Type locality. Ostrov Chechen' (island in NW Caspian Sea), Dagestan, Russia.

Distribution. Endemic to the Caspian Sea. Occurred also in the Aral Sea during the Holocene (Filippov and Riedel 2009) but now extinct there. It has been reported from the Holocene of Danube Delta (Anistratenko and Prisjazhnjuk 1992) (see below).

Taxonomic notes. As the oldest described species presently attributed to *Turricaspia*, the validity of this species is without doubt. Its identity, however, is poorly known, given the limited information and poor drawing provided by Eichwald (1855), as well as the largely diverging concepts applied by later authors (see Neubauer et al. 2018 for a detailed discussion of the matter). We have a geographic record (Anistratenko and Prisjazhnjuk 1992) that is outside the Caspian–Aral distribution range of this genus. Comparison of the Danube material with Caspian specimens suggests the identification might be correct, yet further detail study is required to assess whether the Danube record might actucally not be an unusual form of *Laevicaspia lincta*.

Conservation status. Not assessed.

Turricaspia turricula (Clessin & Dybowski in Dybowski, 1887)

*1887 *Micromelania turricula* Clessin & Dybowski in Dybowski: 34.
1888 [*Micromelania*] *turricula* n. sp. – Dybowski: 78, pl. 1, fig. 3a–c.
2006 *Turricaspia turricula* (Clessin & W. Dybowski in W. Dybowski, 1888). – Kantor and Sysoev: 111, pl. 49, fig. I.
2016 *Turricaspia turricula* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 244.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Middle and southern Caspian Sea. This species was mentioned from depths between 200 and 500 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017).

Taxonomic notes. The species is characterised by a slender conical shell with weakly convex whorls with weak subsutural swelling and a slightly inflated body whorl with large aperture.

Conservation status. Not assessed.

Turricaspia uralensis (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Turricaspia*) *uralensis* Logvinenko & Starobogatov: 359, fig. 360(1).
2016 *Pyrgula uralensis* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 244.

Status. Pontocaspian species, identity uncertain.

Type locality. Eastern part of the northern Caspian Sea.

Distribution. Type locality only.

Taxonomic notes. Logvinenko and Starobogatov (1969) illustrated a comparably small shell with eight highly convex whorls, large body whorl, and large aperture. Reliable assessment of the species' status requires investigation of the type material, which has only been discovered in ZIN in June 2018 and awaits further study.

Conservation status. Not assessed.

Turricaspia vinogradovi (Logvinenko & Starobogatov, 1969)

*1969 *Pyrgula* (*Oxypyrgula*) *vinogradovi* Logvinenko & Starobogatov: 368, fig. 363(9).
?1971 *Pyrgula astrachanica* Pirogov: 249–251, fig. 1.
?2006 *Turricaspia astrachanica* (Pirogov, 1971). – Kantor and Sysoev: 105, pl. 48, fig. B.
2006 *Turricaspia vinogradovi* (Logvinenko & Starobogatov, 1968). – Kantor and Sysoev: 111, pl. 50, fig. C.
2016 *Turricaspia vinogradovi* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 251.

Status. Pontocaspian species, identity uncertain.

Type locality. Northern Caspian Sea.

Distribution. Northern Caspian Sea and Volga Delta (Logvinenko and Starobogatov 1969).

Taxonomic notes. The species as illustrated by Logvinenko and Starobogatov (1969) is based on a slender shell with highly convex whorls. The same traits are also typical for *Pyrgula astrachanica*; in fact, the type of *T. vinogradovi* could be a juvenile of that species. Moreover, both of them might be synonyms of *Turricaspia nossovi* Kolesnikov, 1947. Since a part of the type material of the species involved is lacking and some of the taxa are based on incomplete or presumably juvenile specimens, the identities of *Pyrgula astrachanica* and *Turricaspia vinogradovi* remain unresolved.

Conservation status. *Turricaspia vinogradovi* has not been assessed by the IUCN, *T. astrachanica* is marked as "Data Deficient" (Vinarski 2011q).

Hydrobiidae incertae sedis

Abeskunus brusinianus (Clessin & Dybowski in Dybowski, 1887)

*1887 *Zagrabica Brusiniana* Clessin & Dybowski in Dybowski: 52–53.
1888 *Zagrabica Brusiniana* n. sp. – Dybowski: 79, pl. 2, fig. 7.
2006 *Pseudamnicola brusiniana* (Clessin & W. Dybowski in W. Dybowski, 1888). – Kantor and Sysoev: 114, pl. 51, fig. J.
2016 *Pseudamnicola brusiniana* (Clessin & W. Dybowski in W. Dybowski, 1888). – Vinarski and Kantor: 222.
2018 *Abeskunus brusinianus* (Clessin & W. Dybowski in W. Dybowski, 1887). – Neubauer et al.: 87–88, fig. 16A–I.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Middle and southern Caspian Sea (Logvinenko and Starobogatov 1969, Parr et al. 2007). Mirzoev and Alekperov (2017) mention *Pseudamnicola brusinianus* from depths between 200 and 400 m in the South Caspian Basin of

Azerbaijan but we are not entirely certain whether these records might include other *Abeskunus* species as well.

Taxonomic notes. For a detailed description and discussion, see Neubauer et al. (2018).

Conservation status. Least Concern (Vinarski 2011c).

Abeskunus depressispira (Logvinenko & Starobogatov, 1969)

*1969 *Pseudamnicola* (*Abeskunus*) *depressispira* Logvinenko & Starobogatov: 381, fig. 367(14).
2016 *Pseudamnicola depressispira* Logvinenko & Starobogatov, 1968. – Vinarski and Kantor: 222–223.

Status. Accepted Pontocaspian species.

Type locality. Western part of the southern Caspian Sea, northward of Kuraginsky Kamen' [= Kür Daşı] Island (approximately 39°01'05"N, 49°20'02"E), 81 m water depth.

Distribution. In addition to the type locality, specimens have been found in Holocene material retrieved near the Kura Delta, a few kilometres north of the type locality.

Taxonomic notes. Current investigations on recently collected Holocene material from the south-western Caspian Sea confirm that this species belongs to the genus *Abeskunus*. The finely ribbed, low trochiform shell facilitates distinction from its congeners. The species epithet is based on the Latin noun *spira*, spire, and is to be considered a noun in apposition (ICZN 1999, Art. 31.2.1.).

Conservation status. Data Deficient (Vinarski 2011d).

Abeskunus exiguus (Eichwald, 1838)

°1837 *Lithoclypus* [sic] *Caspius* m. – Krynicki: 58 (nomen nudum).
*1838 *Paludina exigua* Eichwald: 152–153.
1863 *Bithinia sphaerion* Mousson: 409–410.
1874 *Lithoglyphus*? *Caspius* Krynicki. – Martens: 80.
1877 *Lithoglyphus caspius* Grimm: 82–84, pl. 9, fig. 8.
1977 *Pseudamnicola* (*Abeskunus*) *brusiniana michelae* Tadjalli-Pour: 108, pl. 2, fig. 9.
2016 *Pseudamnicola exigua* (Eichwald, 1838). – Vinarski and Kantor: 223.
2016 *Pseudamnicola sphaerion* (Mousson, 1863). – Vinarski and Kantor: 223.

Status. Accepted Pontocaspian species.

Type locality. In fossil (likely Pleistocene) limestone of Dagestan, Russia.

Distribution. Western Caspian Sea, known from northern and southern parts. Records from the eastern Caspian Sea by Logvinenko and Starobogatov (1969) could not be confirmed.

Taxonomic notes. An in-depth study of the literature suggests that the names *Paludina exigua*, *Bithinia sphaerion* syn. n., and *Lithoglyphus caspius* all refer to the

same species. The name *Lithoglyphus caspius* was made available by Martens (1874) by referring to the description and illustration of Eichwald's species, rendering *L. caspius* a junior objective synonym of *Abeskunus exiguus*. All three taxa share the globular shape, short spire, and inflated last whorl. The subspecies *Pseudamnicola brusiniana michelae* syn. n. from Iranian coasts of the Caspian Sea closely resembles *A. exiguus* and is herein considered a synonym as well. *Abeskunus exiguus* differs from *A. brusinianus* in the highly globular shell with small spire. A revision of the species is currently being prepared.

Conservation status. Not assessed.

Andrusovia andrusovi Starobogatov, 2000

*2000 *Andrusovia andrusovi* Starobogatov: 39–41, fig. 1B.
2016 *Andrusovia andrusovi* Starobogatov, 2000. – Vinarski and Kantor: 214.

Status. Pontocaspian species, identity uncertain.

Type locality. Eastern part of the South Caspian Sea (39°05'N, 52°35'E).

Distribution. Middle and southern Caspian Sea (Starobogatov 2000).

Taxonomic notes. The species is very similar to the type species of *Andrusovia*, *A. dybowskii*, regarding the low spire. Investigation of the type material is required to clarify whether both taxa are distinct.

Remarks. Only recently, paratypes of this species were detected at the Zoological Museum of Moscow University. A study of the taxonomy of *Andrusovia* is currently under way.

Conservation status. Not assessed.

Andrusovia brusinai Starobogatov, 2000

*2000 *Andrusovia brusinai* Starobogatov: 41, fig. 1C.
2016 *Andrusovia brusinai* Starobogatov, 2000. – Vinarski and Kantor: 214.
2018 *Andrusovia brusinai* Starobogatov, 2000. – Neubauer et al.: 54–56, fig. 6F–K, M–N.

Status. Pontocaspian species, identity uncertain.

Type locality. Eastern part of the middle Caspian Sea (42°42.5'N, 51°32.5'E), at 80 m water depth.

Distribution. Northern, middle, and southern Caspian Sea (Starobogatov 2000, Neubauer et al. 2018).

Taxonomic notes. The species was recently described in detail by Neubauer et al. (2018). The species was distinguished from *A. dybowskii* and *A. andrusovi* by the higher spire, but this is a variable character. Currently, the taxonomy of *Andrusovia* species is the subject of further study.

Remarks. Starobogatov (2000) mentioned that the type material is housed in the ZIN collection, but we were unable to find the holotype and it is presumed lost. Only

recently, paratypes of this species were detected at the Zoological Museum of Moscow University and are currently being studied.

Conservation status. Not assessed.

Andrusovia dybowskii Brusina in Westerlund, 1902b

*1902b *Andrusovia Dybowskii* Westerlund: 133.
? 2000 *Andrusovia dybowskii* Brusina in Westerlund, 1903. – Starobogatov: 39, fig. 1A.
2016 *Andrusovia dybowskii* Brusina in Westerlund, 1903. – Vinarski and Kantor: 214.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Middle and southern Caspian Sea (Starobogatov 2000).

Taxonomic notes. Apparently, Brusina considered both the more conical and flatter shells ("conoidea vel discoidea") to belong to a single species. Starobogatov (2000) in turn referred only the flat type to as *Andrusovia dybowskii* and considered the conical ones to belong to separate species (*A. brusinai* and *A. marina*). The recently rediscovered type material represents the conico-globular type and is currently subject of study by V. Anistratenko and collaegues.

Conservation status. Not assessed.

Andrusovia marina (Logvinenko & Starobogatov, 1969)

*1969 *Horatia* (*Caspiohoratia*) *marina* Logvinenko & Starobogatov: 382, fig. 367(18).
2000 *Andrusovia marina* (Logvinenko & Starobogatov, 1969). – Starobogatov: 41–42, fig. 1D.
2016 *Andrusovia marina* (Logvinenko & Starobogatov, 1968). – Vinarski and Kantor: 214–215.

Status. Pontocaspian species, identity uncertain.

Type locality. Northern slope of the middle Caspian Sea Basin, 43°32.5'N, 49°17.5'E, 60 m water depth.

Distribution. Middle and southern Caspian Sea (Starobogatov 2000). This species was mentioned from depths between 200 and 400 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Horatia marina*).

Taxonomic notes. According to Neubauer et al. (2018), this species might be a senior synonym of *A. brusinai* Starobogatov, 2000. Inspection of recently discovered type material appears to support that view, but more in-depth studies are required to evaluate the status of this species.

Remarks. The holotype is not traced and presumed lost. Only recently, paratypes of this species were detected at the Zoological Museum of Moscow University and are currently being studied.

Conservation status. Not assessed.

Family Lithoglyphidae Tryon, 1866

Lithoglyphus naticoides (Pfeiffer, 1828)

*1828 *Paludina naticoides* Pfeiffer: 45–46, pl. 8, figs 1, 2, 4.
2012 *Lithoglyphus naticoides* (Pfeiffer, 1828). – Welter-Schultes: 41, unnumbered text figures.
2016 *Lithoglyphus naticoides* (C. Pfeiffer, 1828). – Vinarski and Kantor: 253.

Status. Accepted native species.

Type locality. In the Danube at Vienna, Austria, and at Pesth (today part of Budapest), Hungary.

Distribution. Originally only in rivers entering the Black Sea, in the Danube up to Regensburg (Germany). After 1800, also introduced to Elbe and Rhine regions by artificial canals; after 1900 in France (Welter-Schultes 2012). Very common in the Volga Delta (Vinarski et al. 2018).

Conservation status. Least Concern (Van Damme 2011b).

Family Tateidae Thiele, 1925

Potamopyrgus antipodarum (Gray, 1843)

*1843 *Amnicola antipodarum* Gray: 241.
1951 *Potamopyrgus jenkinsi* E. A. Smith 1889. – Grossu: 693–695, fig. 1a–d.
1966 *P.*[*yrgula*] (*Trachycaspia*?) *grossui* Golikov and Starobogatov: 359.
1991 *Potamopyrgus polistchuki* Anistratenko: 75, fig. 1(2).
1995 *Potamopyrgus alexenkoae* Anistratenko in Anistratenko and Stadnichenko: 92–93, fig. 69.
2012 *Potamopyrgus antipodarum* (Gray, 1843). – Welter-Schultes: 40, unnumbered text figures.

Status. Accepted species, invasive.

Type locality. New Zealand (no details).

Distribution. Originally from New Zealand, probably introduced in 1859 to England, in 1872 to Tasmania, in 1895 to mainland Australia, in ca. 1900 to European mainland (Ponder 1988), and in 1987 to North America (Zaranko et al. 1997).

Taxonomic notes. The two Black Sea species *P. polistchuki* syn. n. and *P. alexenkoae* syn. n. are here considered as junior synonyms of *P. antipodarum*, differing only very weakly in outline. Vinarski and Kantor (2016) listed *Pyrgula* (*Trachycaspia*?) *grossui* syn. n. Golikov & Starobogatov in the synonymy of *T. dimidiata* (Eichwald, 1838). Golikov and Starobogatov (1966) introduced this species as new name for the supposedly misidentified *Potamopyrgus jenkinsi* sensu Grossu (1951) from Razim Lake

in Romania. The shell they later illustrated (Golikov and Starobogatov 1972) indeed shows similarities with *T. dimidiata*. The shell illustrated in Grossu (1951), however, is completely different and shows a keeled form of *P. antipodarum*.

Conservation status. Least Concern (Van Damme 2013).

Family Planorbidae Rafinesque, 1815

Gyraulus eichwaldi (Clessin & Dybowski in Dybowski, 1887)

°1876 *Pl.*[*anorbis*] *Eichwaldi*. – Grimm: 157 (nomen nudum).
*1887 *Planorbis Eichwaldi* Clessin & Dybowski in Dybowski: 49–52.
1888 *Planorbis Eichwaldi* Grimm. – Dybowski: 79, pl. 2, fig. 11a–c, pl. 3, fig. 10a–c.
?1966b *Anisus* (*Andrusowia*) [sic] *eichwaldi infundibularis* Logvinenko and Starobogatov: 1472, fig. 4.
?1977 *Anisus djalali* Tadjalli-Pour: 109, pl. 2, fig. 10.
2016 *Gyraulus* (*Gyraulus*) *eichwaldi* (Grimm in W. Dybowski, 1888). – Vinarski and Kantor, 2016: 378.

Status. Accepted Pontocaspian species.

Type locality. Caspian Sea (no details).

Distribution. Middle and southern Caspian Sea (Logvinenko and Starobogatov 1969). This species was mentionedfrom depths between 200 and 900 m in the South Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Anisus eichwaldi*).

Taxonomic notes. The species is characterised by a relatively large, asymmetrical shell. *Anisus eichwaldi infundibularis* is probably a morphotype of *G. eichwaldi*. We are uncertain about the status of *Anisus djalali* Tadjalli-Pour, 1977 as the description is very brief and the photographs are not very clear. It may be within the range of the morphological variability of *G. eichwaldi*.

Conservation status. Not assessed.

Gyraulus dybowskii (Kolesnikov, 1947)

*1947 *Planorbis eichwaldi* var. *dybowskii* Kolesnikov: 109, 112, fig. in tab. 1.
1966b *Anisus* (*Andrusowia*) [sic] *kolesnikovi* Logvinenko and Starobogatov: 1473, fig. 5.
1966b *Anisus* (*Andrusowia*) [sic] *kolesnikovi sublittoralis* Logvinenko and Starobogatov: 1472–1473, fig. 6.
2016 *Gyraulus* (*Gyraulus*) *kolesnikovi* (Logvinenko & Starobogatov, 1966). – Vinarski and Kantor, 2016: 379.

Status. Pontocaspian species, identity uncertain.

Type locality. Caspian Sea, 40°37'N, 50°52'E, 115 m.

Distribution. Middle and southern Caspian Sea (Logvinenko and Starobogatov 1969). This species was mentioned from depths between 200 and 300 m in the South

Caspian Basin of Azerbaijan (Mirzoev and Alekperov 2017, who reported the species as *Anisus colesnikovi* [sic]).

Taxonomic notes. Logvinenko and Starobogatov (1966b) considered this species and *Andrusovia dybowskii* Brusina in Westerlund, 1902b to belong in the same genus, *Anisus* (*Andrusovia*), rendering *P. dybowskii* Kolesnikov, 1947 a junior homonym. Therefore, they introduced *A. kolesnikovi* as replacement name. Since both taxa do clearly not belong to the same genus or even the same family, the replacement name is to be discarded.

The species resembles *G. eichwaldi* regarding the general habitus; it differs in the more pronounced angle at the transition between whorl flank and apical plane. A revision is required to investigate if the Caspian *Gyraulus* species are distinct species or morphotypes of *G. eichwaldi*. The generic placement follows Vinarski and Kantor (2016). Note that those authors listed the earlier described *P. eichwaldi dybowskii* Kolesnikov, 1947 as a synonym of *G. kolesnikovi*.

Conservation status. Least Concern (for *Anisus kolesnikovi*; Vinarski 2011a).

Gyraulus sulcatus (Logvinenko & Starobogatov, 1966, non Hilgendorf, 1867)

*1966b *Anisus* (*Andrusowia*) [sic] *sulcatus* Logvinenko & Starobogatov: 1474, fig. 7.
2016 *Gyraulus* (*Gyraulus*) *sulcatus* (Logvinenko & Starobogatov, 1966). – Vinarski and Kantor, 2016: 382.

Status. Pontocaspian species, identity uncertain, name invalid.

Type locality. Caspian Sea, 42°45'N, 48°29'E, 79 m.

Distribution. Middle Caspian Sea (Logvinenko and Starobogatov 1969).

Taxonomic notes. The species in its present combination as *Gyraulus sulcatus* (following Vinarski and Kantor 2016) is invalid as it is a secondary homonym of the Miocene *Gyraulus sulcatus* (Hilgendorf, 1867). We refrain here from introducing a replacement name as the species' status is uncertain. It resembles *G. eichwaldi* and *G. kolesnikovi* in outline shape and differs only in the more pronounced angle between whorl flank and apical plane and the shallow furrow on the apical side. An in-depth revision is required to clarify if *Gyraulus sulcatus* is a distinct species or a mere morphotype of *G. eichwaldi* (Clessin & Dybowski in Dybowski, 1887).

Conservation status. Not assessed.

Discussion and conclusions

The annotated check-list presented here is a first attempt to assess the species diversity of the Pontocaspian molluscs by experts working in different countries and fields (neontology, palaeontology, biogeography, phylogenetics). Hitherto, progress has been limited by a number of factors: (1) fresh material for genetic studies is available only for few nominal species, and (2) the type series of many species are lost or at least have not yet been found. This concerns not only the species described by Eichwald or Grimm in the

19th century; the type specimens of many species established by Starobogatov and his co-workers in the 1960–2000s could not be traced in ZIN (Kantor and Sysoev 2006, Vinarski and Kantor 2016). Furthermore, progress has been limited by (3) a lack of representative shell samples to undertake quantitative statistical analyses of conchological variation, and (4) insufficient ecological and distribution data for many of the species.

Three species that have been reported from the Pontocaspian region are not included in this list. The bithyniid gastropod *Alocinma caspica* (Westerlund, 1902) has been described from the east side of the Caspian Sea (Beriozkina et al. 1995 indicated this record is probably from the vicinity of Krasnovodsk, Turkmenistan). However, Starobogatov et al. (2004) argued the species lives in waterbodies of Bol'shoy Balkhan (Turkmenistan) and probably not in the Caspian Sea itself (Vinarski et al. 2013, Vinarski and Kantor 2016). Furthermore, two *Pseudamnicola* species have been described from Lake Razim in Romania (*P. leontina* Grossu, 1986 and *P. razelmiana* Grossu, 1986) that is prime Pontocaspian habitat. Like bithyniids, *Pseudamnicola* has not been reported as a Pontocaspian group elsewhere, and probably they are freshwater species that live in the surrounding streams or in springs. For now, we have excluded these species from the Pontocaspian species list.

This list contains 55 accepted and a further 44 uncertain endemic Pontocaspian mollusc species (Table 2), here defined as species that are considered to be endemic for at least one of the Pontocaspian basins. There are 14 native and three immigrant species (at least in one of the Pontocaspian basins), even though some species may be native or endemic in one of the basins and have become invasive in another of the Pontocaspian Basins. All species that have an uncertain status belong to the Pontocaspian category. The Caspian Sea Basin has the highest number of accepted endemic Pontocaspian species (48) but also poses the greatest taxonomic challenges, with a further 37 species whose status are unclear.

The species richness estimate reflects the current shift of molluscan systematics from morphology-based to integrated studies, with increasing contributions of molecular and statistical species delineation approaches (Vinarski 2018). It has recently been shown that many nominal taxa of fresh- and brackish-water snails and mussels described on the basis of their shell characters (the Pontocaspian molluscs rarely were described on the base of anatomical studies) lack a genetic support (with few exceptions such as e.g., Popa et al. 2012, Stepien et al. 2013) and thus do not represent evolutionary meaningful units. On the other hand, cryptic speciation is known within many taxa of molluscs in long-lived lakes (Albrecht et al. 2006), and the Pontocaspian biota may include some previously unrecognised species. Thus, we consider our check-list rather as a starting point for further integrated research, not a definitive and fixed inventorisation of the Pontocaspian molluscs.

Anyone who reads this list or works such as Logvinenko and Starobogatov (1969) or Vinarski and Kantor (2016) may think that the Caspian Sea still maintains its unique and species-rich mollusc fauna. However, the actual state of affairs is problematic as many species thought to be endemic to this large saline lake have not been found since their description, and recent attempts to obtain fresh material for genetic studies mostly failed. Clearly, the conservation status of Pontocaspian species is insufficiently known. With our working list we aim to assist in the necessary follow-up conservation assessments.

Table 2. Pontocaspian mollusc species list. Abbreviations: Status: A – accepted, U – uncertain. Basins: AS – Aral Sea, BSB – Black Sea Basin, CSB – Caspian Sea Basin. Species are E – endemic, EX – extinct, IM – immigrant, IN – invasive, N – native (definitions in Table 1); *species encountered alive during the PRIDE program expeditions by participants; †very fresh material of species encountered, but not living specimens.

Species	Status	BSB	CSB	AS
Mytilaster minimus (Poli, 1795)*	A	N	IN	IM/EX
Adacna laeviuscula (Eichwald, 1829)	A	?	E	
Adacna fragilis Milaschewitsch, 1908	U	E		
Adacna minima Ostroumov, 1907	A		E	E/EX?
Adacna minima ostroumovi (Logvinenko & Starobogatov, 1967)	U		E	
Adacna vitrea (Eichwald, 1829)	A	E	E	E/EX?
Adacna vitrea glabra Ostroumov, 1905	U	E	E	
Adacna vitrea bergi (Starobogatov, 1974)	U			E/EX?
Cerastoderma glaucum (Bruguière, 1789) s.l.*	A	N	IN	IN?
Cerastoderma sp. A [non *C. rhomboides* (Lamarck, 1819)]*	A	N	IN	IN?
Didacna baeri (Grimm, 1877)	A		E	
Didacna barbotdemarnii (Grimm, 1877)*	A		E	
Didacna eichwaldi (Krynicki, 1837)	A		E	
Didacna longipes (Grimm, 1877)*	A		E	
Didacna parallela Bogachev, 1932	A		E	
Didacna praetrigonoides Nalivkin & Anisimov, 1914	A		E/EX	
Didacna profundicola Logvinenko & Starobogatov, 1966†	A		E	
Didacna protracta (Eichwald, 1841)	A		E	
Didacna pyramidata (Grimm, 1877)	A		E	
Didacna trigonoides (Pallas, 1771)*	A		E	
Hypanis plicata (Eichwald, 1829)	A	E	E	
Monodacna acuticosta (Logvinenko & Starobogatov, 1967)	A		E	
Monodacna albida (Logvinenko & Starobogatov, 1967)	A		E	
Monodacna caspia (Eichwald, 1829)	A		E	?
Monodacna colorata (Eichwald, 1829)*	A	E	IM	
Monodacna filatovae (Logvinenko & Starobogatov, 1967)	U		E	
Monodacna knipowitschi (Logvinenko & Starobogatov, 1966)	U		E	
Monodacna polymorpha (Logvinenko & Starobogatov, 1967)	U		E	
Monodacna semipellucida (Logvinenko & Starobogatov, 1967)	A		E	
Abra segmentum (Récluz, 1843)*	A	N	IN	IN
Corbicula fluminalis (Müller, 1774)	A		N/IN	
Dreissena bugensis Andrussov, 1897†	A	E/IN	IN	
Dreissena caspia Eichwald, 1855	A		E/EX	E/EX
Dreissena elata Andrusov, 1897	U		E/EX	
Dreissena grimmi (Andrusov, 1890)*	A		E	
Dreissena polymorpha (Pallas, 1771) s.l.*	A	N	N	N
Mytilopsis leucophaeata (Conrad, 1831)*	A	IN	IN	
Theodoxus danubialis (Pfeiffer, 1828)*	A	N		
Theodoxus fluviatilis (Linnaeus, 1758)	A	N		
Theodoxus pallasi Lindholm, 1924*	A	N	N	N/EX?
Theodoxus schultzii (Grimm, 1877)*	U		E	
Theodoxus velox V. Anistratenko in O. Anistratenko et al., 1999	A	N		
Eupaludestrina stagnorum (Gmelin, 1791)	A	N/IM	N/IM	
Caspia baerii Clessin & Dybowski in Dybowski, 1887	A	E?	E	
?*Caspia valkanovi* (Golikov & Starobogatov, 1966)	U	E		
Clathrocaspia brotzkajae (Starobogatov in Anistratenko & Prisjazhnjuk, 1992)	A	?E	E	
Clathrocaspia gmelinii (Clessin & Dybowski in Dybowski, 1887)	A		E	
Clathrocaspia isseli (Logvinenko & Starobogatov, 1969)	U		E	

Species	Status	BSB	CSB	AS
Clathrocaspia knipowitschii (Makarov, 1938)	A	E		
Clathrocaspia logvinenkoi (Golikov & Starobogatov, 1966)	A	E		
Clathrocaspia milae Boeters, Glöer & Georgiev, 2015	U	E		
Clathrocaspia pallasii (Clessin & Dybowski in Dybowski, 1887)	A		E	
Ulskia behningi (Logvinenko & Starobogatov, 1969)	U		E	
?Ulskia derzhavini (Logvinenko & Starobogatov, 1969)	U		E	
Ulskia ulskii (Clessin & Dybowski in Dybowski, 1887)	A		E	
Ecrobia grimmi (Clessin in Dybowski, 1887)*	A		N	N
Ecrobia maritima (Milaschewitsch, 1916)*	A	N		
Ecrobia ventrosa (Montagu, 1803)	A	IM		
Clessiniola variabilis (Eichwald, 1838)	A	E	E	
Laevicaspia abichi (Logvinenko & Starobogatov, 1969)	A		E	
Laevicaspia caspia (Eichwald, 1838)	A		E	
Laevicaspia cincta (Abich, 1859)	A		E	
Laevicaspia conus (Eichwald, 1838)	A		E	
?Laevicaspia ebersini (Logvinenko & Starobogatov, 1969)	U		E	
?Laevicaspia ismailensis (Golikov & Starobogatov, 1966)	A	E		
Laevicaspia kolesnikoviana (Logvinenko & Starobogatov in Golikov & Starobogatov, 1966)	A		E	
Laevicaspia kowalewskii (Clessin & Dybowski in Dybowski, 1887)	A		E	
Laevicaspia lencoranica (Logvinenko & Starobogatov, 1969)	U		E	
Laevicaspia lincta (Milaschewitsch, 1908)	A	E		
?Laevicaspia marginata (Westerlund, 1902)	U		E	
Laevicaspia sieversii (Clessin in Dybowski, 1887)	U		E	
?Turricaspia aenigma (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia andrussowi (Dybowski & Grochmalicki, 1915)	A		E	
?Turricaspia basalis (Dybowski & Grochmalicki, 1915)	U		E	
?Turricaspia bogatscheviana (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia chersonica Alexenko & Starobogatov, 1987	U	E		
Turricaspia columna (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia concinna (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia dagestanica (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia dimidiata (Eichwald, 1838)	A		E	
Turricaspia eburnea (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia elegantula (Clessin & Dybowski in Dybowski, 1887)	U		E	
Turricaspia eulimellula (Dybowski & Grochmalicki, 1915)	A		E	
Turricaspia fedorovi (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia grimmi (Clessin & Dybowski in Dybowski, 1887)	A		E	
Turricaspia lyrata (Dybowski & Grochmalicki, 1915)	A		E	
Turricaspia marisnigri Starobogatov in Alexenko & Starobogatov, 1987	U	E/EX?		
Turricaspia meneghiniana (Issel, 1865)	A		E	
Turricaspia nossovi Kolesnikov, 1947	A		E	
?Turricaspia obventicia (Anistratenko in Anistratenko & Prisjazhnjuk, 1992)	U	E		
?Turricaspia pseudobacuana (Logvinenko & Starobogatov, 1969)	U		E	
?Turricaspia pseudodimidiata (Dybowski & Grochmalicki, 1915)	U		E	
Turricaspia pseudospica (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia pulla (Dybowski & Grochmalicki, 1915)	A		E	
Turricaspia pullula (Dybowski & Grochmalicki, 1915)	A		E	
Turricaspia rudis (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia sajenkovae (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia similis (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia simplex (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia spasskii (Logvinenko & Starobogatov, 1969)	A		E	
Turricaspia spica (Eichwald, 1855)	A	?E	E	?E
Turricaspia turricula (Clessin & Dybowski in Dybowski, 1887)	A		E	

Species	Status	BSB	CSB	AS
Turricaspia uralensis (Logvinenko & Starobogatov, 1969)	U		E	
Turricaspia vinogradovi (Logvinenko & Starobogatov, 1969)	U		E	
Abeskunus brusinianus (Clessin & Dybowski in Dybowski, 1887)	A		E	
Abeskunus depressispira (Logvinenko & Starobogatov, 1969)	A		E	
Abeskunus exiguus (Eichwald, 1838)	A		E	
Andrusovia andrusovi Starobogatov, 2000	U		E	
Andrusovia brusinai Starobogatov, 2000	U		E	
Andrusovia dybowskii Brusina in Westerlund, 1902	A		E	
Andrusovia marina (Logvinenko & Starobogatov, 1969)	U		E	
Lithoglyphus naticoides (Pfeiffer, 1828)*	A	N	IM?	
Potamopyrgus antipodarum (Gray, 1843)*	A	IM		
Gyraulus eichwaldi (Clessin & Dybowski in Dybowski, 1887)†	A		E	
Gyraulus dybowskii (Kolesnikov, 1947)	U		E	
Gyraulus sulcatus (Logvinenko & Starobogatov, 1966)	U		E	

Most taxonomic difficulties were encountered for the bivalve genera *Monodacna* and *Dreissena* and the Pyrgulinae gastropods (especially genera *Turricaspia* and *Laevicaspia*). Furthermore, there is an urgent need to assess whether representatives of species complexes in the three main Pontocaspian basins (Aral Sea, Caspian Sea, Black Sea) concern separate species as several of these regional populations are in immediate danger of extinction or already extinct (for example with the disappearance of the Aral Sea). Combined methodological efforts will enable us to estimate the extent and characterise the nature of Pontocaspian faunal turnover, and this species list is a first attempt in the required uniform taxonomic base.

Acknowledegments

The PRIDE program has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No. 642973. TAN was supported by an Alexander-von-Humboldt Scholarship. Further support came from the German Research Foundation (DFG, grant no. WI1902/14) to TW. MV has financial support from the Russian Ministry of Higher Education and Science (project no. 6.1352.2017/4.6). TY was supported by the Russian Science Foundation (grant no. 16-17-10103). We thank Ana Bianca Pavel (Geoecomar, Constanța, Romania) and AS Gasanova (Makhachkala, Russia) for additional observations on living species occurrences. We are furthermore grateful to Dietrich Kadolsky and Mathias Harzhauser, as well as to the editor Eike Neubert and the technical editor Nathalie Yonow, for constructive comments.

References

Abich H (1859) Vergleichende chemische Untersuchungen der Wasser des Caspischen Meeres, Urmia- und Van-See's. Mémoires de l'Académie impériale des sciences de St.-Pétersbourg,

6e série, Sciences mathématiques, physiques et naturelles 7: 1–57. https://biodiversitylibrary.org/page/46467180

Akramovskiy NN (1976) Fauna Armyanskoy SSR. Mollyuski (Mollusca). Izvestiya Akademii Nauk Armyanskoy SSR, Yerevan, 268 pp.

Aladin NV, Filippov AA, Plotnikov IS, Orlova MI, Williams WD (1998) Changes in the structure and function of biological communities in the Aral Sea, with particular reference to the northern part (Small Aral Sea), 1985–1994: A review. International Journal of Salt Lake Research 7(4): 301–343. https://doi.org/10.1023/A:1009009924839

Albrecht C, Trajanovski S, Kuhn K, Streit B, Wilke T (2006) Rapid evolution of an ancient lake species flock: freshwater limpets (Gastropoda: Ancylidae) in the Balkan Lake Ohrid. Organisms, Diversity & Evolution 6(4): 294–307. https://doi.org/10.1016/j.ode.2005.12.003

Albrecht C, von Rintelen T, Sereda S, Riedel F (2014) Evolution of ancient lake bivalves: the Lymnocardiinae (Cardiidae) of the Caspian Sea. Hydrobiologia 739(1): 85–94. https://doi.org/10.1007/s10750-014-1908-3

Alexenko TL, Starobogatov YaI (1987) Vidy *Caspia* i *Turricaspia* (Gastropoda, Pectinibranchia, Pyrgulidae) Azovo-Chernomorskogo basseyna. Vestnik Zoologii 21(3): 32–38.

Andreev NI, Andreeva SI, Filippov AA, Aladin NV (1992) The fauna of the Aral Sea in 1989. 1. The benthos. International Journal of Salt Lake Research 1(1): 103–110. https://doi.org/10.1007/BF02904954

Andreeva SI, Andreev NI (2003) Evolyutsionnyye preobrazovaniya dvustvorchatykh mollyuskov Aral'skogo morya v usloviyakh ekologicheskogo krizisa. Omskiy Gosudarstvennyy Pedagogicheskiy Universitet, Omsk, 382 pp. http://herba.msu.ru/shipunov/school/books/andreevy2003_evol_moll_aral.pdf

Andrusov N (1890) Kerchenskiy izvestnyak i yego fauna. Zapiski Imperatorskago S.-Peterburgskago Mineralogicheskago Obshchestva (seriya 2) 26: 193–344.

Andrusov N (1897) Fossile und lebende Dreissenidae Eurasiens. Tipografiya M. Merkusheva, St. Petersburg, 683 pp. https://biodiversitylibrary.org/page/35041266 [atlas]

Andrusov N (1909) Beiträge zur Kenntnis des Kaspischen Neogen. Pontischen Schichten des Schemachinischen Distriktes. Mémories du Comité Géologique, nouvelle série 40: 1–177.

Andrusov N (1910) Studien über die Brackwassercardiden. *Didacna* (erste Hälfte). Lieferung II. Mémoires de l'Académie impériale des sciences de St.-Pétersbourg. VIIIe série. Classe physico-mathématique 25(8): 1–84. https://biodiversitylibrary.org/page/36733928

Anistratenko OYu, Starobogatov YaI, Anistratenko VV (1999) Mollyuski roda *Theodoxus* (Gastropoda, Pectinibranchia, Neritidae) Azovo-Chernomorskogo basseyna. Vestnik Zoologii 33(3): 11–19.

Anistratenko VV (1991) Mollyuski gruppy *Hydrobia* sensu lato Chernogo i Azovskogo morey. Byulleten' Moskovskogo Obshchestva Ispytateley Prirody, Otdel biologicheskiy 96(6): 73–81.

Anistratenko VV (2005) Lectotypes for *Tricolia pullus*, *Gibbula divaricata* and *Theodoxus fluviatilis* revisited. Vestnik Zoologii 39(6): 3–10.

Anistratenko VV (2007a) Finding of the extremely rare hydrobiid *Caspia logvinenkoi* (Mollusca: Gastropoda) in the estuary of the River Don and its zoogeographical significance. Mollusca 25(1): 23–26.

Anistratenko VV (2007b) Novyye dannyye o sostave, strukture i genezise Ponto-Kaspiyskoy fauny bryukhonogikh mollyuskov v Azovo-Chernomorskom basseyne. Zoologicheskiy Zhurnal 86(7): 793–801.

Anistratenko VV (2013) On the taxonomic status of the highly endangered Ponto-Caspian gastropod genus *Caspia* (Gastropoda: Hydrobiidae: Caspiinae). Journal of Natural History 47(1–2): 51–64. https://doi.org/10.1080/00222933.2012.742934

Anistratenko VV, Anistratenko OYu, Shydlovskyy IV (2018) Karl E. von Baer's collection of Caspian Sea mollusks stored in the Zoological Museum of Lviv University, Ukraine. Part 1. Catalogue and general description. Archiv für Molluskenkunde 147(2): 223–236. https://doi.org/10.1127/arch.moll/147/223-236

Anistratenko VV, Khaliman IA, Anistratenko OYu (2011) Mollyuski Azovskogo morya. Naukova dumka, Kiev, 171 pp. http://ashipunov.info/shipunov/school/books/anistratenko2011_moll_azovsk_morja.pdf

Anistratenko VV, Prisyazhniuk VA (1992) Novyye dannyye o mollyuskakh golotsenovykh otlozheniy Chernogo morya na Ukraine. Vestnik Zoologii 5: 15–21.

Anistratenko VV, Stadnichenko AP (1995) Fauna Ukraine. Vol. 29: Mollusca. Fasc. 1. B. 2: Orders Littoriniformes, Rissoiformes. Naukova dumka, Kiev, 175 pp.

Anistratenko VV, Zettler ML, Anistratenko OYu (2017) On the taxonomic relationship between *Theodoxus pallasi* and *T. astrachanicus* (Gastropoda: Neritidae) from the Ponto-Caspian region. Archiv für Molluskenkunde 146(2): 213–226. https://doi.org/10.1127/arch.moll/146/213-226

Bandel K (2001) The history or *Theodoxus* and *Neritina* connected with the description and systematic evaluation of related Neritimorpha (Gastropoda). Mitteilungen aus dem Geologisch-Paläontologischen Institut der Universität Hamburg 85: 65–164. http://www.paleoliste.de/bandel/bandel_2001e.pdf

Barannik V, Borysova O, Stolberg F (2004) The Caspian Sea Region: Environmental Change. AMBIO: A Journal of the Human Environment 33(1): 45–51. https://doi.org/10.1579/0044-7447-33.1.45

Beriozkina GV, Levina OV, Starobogatov YaI (1995) Revision of Bithyniidae from European Russia and Ukraine. Ruthenica 5(1): 27–38.

Boeters HD, Glöer P, Georgiev D, Dedov I (2015) A new species of *Caspia* Clessin et W. Dybowski, 1887 (Gastropoda: Truncatelloidea: Hydrobiidae) in the Danube of Bulgaria. Folia Malacologica 23: 177–186. https://doi.org/10.12657/folmal.023.014

Bogachev VV (1932a) Geologicheskiye ekskursii v okrestnostyakh Baku. Aznefteizdat, Baku, 88 pp.

Bogachev VV (1932b) Vedushchiye iskopayemyye razreza Apsheronskogo poluostrova i prilegayushchikh rayonov. Chast' 1. Trudy Azerbaidzhanskogo Neftyanogo Instituta 4: 1–92.

Bologa AS, Bodeanu N, Petran A, Tiganus V, Zaitsev YuP (1995) Major modifications of the Black Sea benthic and planktonic biota in the last three decades. In: Briand F (Ed.) Les Mers Tributaires de Mediterranée. Bulletin de l'Institut oceanographique, Monaco, no. spécial 15: 85–110. http://ciesm.org/online/monographs/CSS-1/CSS_1_85_110.pdf

Borcea I (1926) Quelques remarques sur les Adacnides et principalement sur les Adacnides des Lacs Razelm. Analele Stiintifice ale Universitatii din Iasi 13(3–4): 449–485.

Bouchet P, Rocroi J-P, Hausdorf B, Kaim A, Kano Y, Nützel A, Parkhaev P, Schrödl M, Strong EE (2017) Revised classification, nomenclator and typification of gastropod and monoplacophoran families. Malacologia 61(1–2): 1–526. https://doi.org/10.4002/040.061.0201

Bourguignat JR (1876) Species novissimae Molluscorum in Europaeo systemati detectae, notis diagnosticis succinctis breviter descriptae. Paul Klincksieck, Paris, 80 pp. https://doi.org/10.5962/bhl.title.10357

Bruguière JG (1789) Encyclopedie methodique. Histoire naturelle des Vers. Tome sixième. Panckoucke & Plomteux, Paris & Liege, 344 pp.

Brusina S (1882) Le Pyrgulinae dell'Europa orientale. Bollettino della Società Malacologica Italiana 7(13–19): 229–292.https://biodiversitylibrary.org/page/39283992

Büyükmeriç Y, Wesselingh FP (2018) New cockles (Bivalvia: Cardiidae: Lymnocardiinae) from Late Pleistocene Lake Karapinar (Turkey): Discovery of a Pontocaspian refuge? Quaternary International 465(A): 37–45. https://doi.org/10.1016/j.quaint.2016.03.018

Chukhchin VD (1975) Sistematicheskoye polozheniye i ekologiya chernomorskikh Hydrobiidae. In: Mollyuski, ikh sistema, evolyutsiya i rol' v prirode. In: 5 Vsesoyuznoye soveshchaniye po izucheniyu mollyukov. Avtoreferaty dokladov. Nauka Publishers, Leningrad, 120–122.

Cioboiu O, Son M, von Rintelen T (2011) *Turricaspia variabilis*. The IUCN Red List of Threatened Species 2011: e.T155608A4807675. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T155608A4807675.en [accessed on 05 December 2018].

Clessin S (1886) Binnenmollusken aus Rumänien. Malakozoologische Blätter (Neue Folge) 8: 49–56. https://biodiversitylibrary.org/page/35594868

Conrad TA (1831) Description of Fifteen New Species of Recent, and three of Fossil Shells, chiefly from the coast of the United States. Journal of the Academy of Natural Sciences of Philadelphia 6: 256–268. https://biodiversitylibrary.org/page/24677674

Coughlan NE, Stevens AL, Kelly TC, Dick JTA, Jansen MAK (2017) Zoochorous dispersal of freshwater bivalves: an overlooked vector in biological invasions? Knowledge & Management of Aquatic Ecosystystems 418: article number 42. https://doi.org/10.1051/kmae/2017037

Cummings K (2011) *Mytilopsis leucophaeata*. The IUCN Red List of Threatened Species 2011: e.T155623A4809971. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T155623A4809971.en [Accessed on 05 December 2018]

Cummings KS, Graf DL (2015) Class Bivalvia. In: Thorp JH, Rogers DC (Eds) Thorp and Covich's Freshwater Invertebrates (Fourth Edition). Academic Press, Elsevier, Boston, 423–506. https://doi.org/10.1016/B978-0-12-385026-3.00019-X

d'Orbigny A (1850) Prodrome de Paléontologie. Stratigraphique universelle des animaux mollusques et rayonnés faisant suitre au cours élémentaire de paléontologie et de géologie stratigraphique. Deuxième volume. Victor Masson, Paris, 427 pp. https://biodiversitylibrary.org/page/41091877

Draparnaud JPR (1805) Histoire naturelle des Mollusques terrestres et fluviatiles de la France. Plassan, Renaud, Paris/Montpellier, 134 pp. https://biodiversitylibrary.org/page/12898711

Dybowski B (1913) Ueber Kaspische Schnecken aus der Abteilung *Turricaspiinae* subfam. nova, zum Vergleich mit den *Turribaicaliinae* subfam. nova. Bulletin de l'Académie Impériale des Sciences de St.-Pétersbourg, sixième série 7(16): 905–906. https://biodiversitylibrary.org/page/4183344

Dybowski B, Grochmalicki J (1915) Ueber kaspische Schnecken aus der Abteilung "Turricaspiinae" subfam. nova zum Vergleich mit den *Turribaikalina* nobis. Petrograd, 34 pp. [Numbered 103–136]

Dybowski B, Grochmalicki J (1917) Studien über die turmförmigen Schnecken des Baikalsees und des Kaspimeeres (Turribaicaliinae – Turricaspiinae). Abhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien 9(3): 1–55. https://biodiversitylibrary.org/page/5550074

Dybowski W (1887–1888) Die Gasteropoden-Fauna des Kaspischen Meeres. Nach der Sammlung des Akademikers Dr. K. E. v. Baer. Malakozoologische Blätter (Neue Folge) 10(1–3): 1–64 [1, 1887], 65–79 [2, 1888], pl. 1–3 [3, 1888]. https://biodiversitylibrary.org/page/35483241

Eichwald E (1829) Zoologia specialis quam expositis animalibus tum vivis, tum fossilibus potissimum Rossiae in universum et Poloniae in specie, in usum lectionum publicarum in Universitate Caesarea Vilnensi habendarum. Pars prior propaedeuticam zoologiae atque specialem heterozoorum expositionem continens. Joseph Zawadzki, Vilnius, 314 pp. https://biodiversitylibrary.org/page/35882071

Eichwald E (1838) Faunae Caspii Maris primitiae. Bulletin de la Société Impériale des Naturalistes de Moscou 11(2): 125–174. https://biodiversitylibrary.org/page/41342125

Eichwald E (1841) Fauna Caspio-Caucasica nonnullis observationibus novis illustravit. Nouveaux Mémoires de la Société Impériale des Naturalistes de Moscou 7: 1–290. https://biodiversitylibrary.org/page/33163057

Eichwald E (1855) Zur Naturgeschichte des Kaspischen Meeres. Nouveaux Mémoires de la Société Impériale des Naturalistes de Moscou 10: 283–323. https://biodiversitylibrary.org/page/33191120

Fedorov PV (1948) Kaspiyskiye mollyuski Zapadnoy Turkmenii. Byulleten' Komissii po Izucheniyu Chetvertichnogo Perioda 13: 54–66. http://ginras.ru/library/pdf/13_1948_bull_quatern_comission.pdf

Fedorov PV (1953) Kaspiyskiye chetvertichnyye mollyuski roda *Didacna* Eichwald i ikh stratigraficheskoye znacheniye. In: [Unknown] Stratigrafiya chetvertichnykh otlozheniy i noveyshaya tektonika Prikaspiyskoy nizmennosti. Akademiya Nauk SSSR, Moskva, 112–130.

Fedorov PV (1957) Stratigrafiya chetvertichnykh otlozheniy i istoriya razvitiya Kaspiyskogo Morya. Trudy Geologicheskogo Instituta Akademii Nauk SSSR 10: 1–298. http://www.ginras.ru/library/pdf/10_1957_fedorov_quaternary_caspian.pdf

Fedorov PV (1999) Ot Kaspiya do Evksina. Zapiski geologa. GEOS, Moskva, 220 pp.

Fehér Z, Zettler ML, Boszó M, Szabó K (2009) An attempt to reveal the systematic relationship between *Theodoxus prevostianus* (C. Pfeiffer, 1828) and *Theodoxus danubialis* (C. Pfeiffer, 1828) (Mollusca, Gastropoda, Neritidae). Mollusca 27(2): 95–107.

Filippov A, Riedel F (2009) The late Holocene mollusc fauna of the Aral Sea and its biogeographical and ecological interpretation. Limnologica 39(1): 67–85. https://doi.org/10.1016/j.limno.2008.04.003

Gadzhiev TM (1968) Izmenchivost' *Didacna baeri* Grimm i nekotoryye novyye vidy *Didacna* novokaspiyskikh otlozheniy ostrovov Bakinskogo arkhipelaga. Paleontologicheskiy Sbornik 1(5): 75–85.

Glöer P (2002) Die Tierwelt Deutschlands, 73. Teil: Die Süßwassergastropoden Nord- und Mitteleuropas. Bestimmungsschlüssel, Lebensweise, Verbreitung. ConchBooks, Hackenheim, 327 pp.

Glöer P, Pešić V (2012) The freshwater snails (Gastropoda) of Iran, with descriptions of two new genera and eight new species. ZooKeys 219: 11–61. https://doi.org/10.3897/zookeys.219.3406

Glöer P, Pešić V (2015) Two new freshwater mollusk species of the genus *Graecoanatolica* Radoman, 1973 from Turkey (Gastropoda: Hydrobiidae). Ecologica Montenegrina 4: 46–51.

Gmelin JF (1774) Reise durch Rußland zur Untersuchung der drey Natur-Reiche. Dritter Theil. Reise durch das nordliche Persien, in den Jahren 1770, 1771, bis im April 1772. Kayserl. Acad. der Wißenschaften, St. Petersburg, 508 pp. https://gdz.sub.uni-goettingen.de/id/PPN63264706X

Gmelin JF (1791) Caroli a Linné, systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Editio decima tertia, aucta, reformata. Tomus I. Pars VI: Vermes. Georg Emanuel Beer, Lipsiae, 3021–3910. https://biodiversitylibrary.org/page/25743606

Golikov AN, Starobogatov YaI (1966) Ponto-kaspiyskiy bryukhonogiye mollyuski v Azovo-Chernomorskom basseyne. Zoologicheskiy Zhurnal 45(3): 352–362.

Golikov AN, Starobogatov YaI (1972) Klass bryukhonogiye mollyuski. In: Mordukhay-Boltovskoy FD (Ed.) Opredelitel' fauny Chernogo i Azovskogo morey: Svobodnozhivushchiye bespozvonochnyye. T.3. Chlenistonogiye (krome rakoobraznykh), mollyuski, iglokozhiye, shchetinkochelyustnyye, khordovyye. Naukova dumka, Kiev, 65–166.

Gomoiu M-T, Alexandrov B, Shadrin N, Zaitsev Yu (2002) The Black Sea – A Recipient, Donor and Transit Area for Alien Species. In: Leppäkoski E, Gollasch S, Olenin S (Eds) Invasive Aquatic Species of Europe. Distribution, Impacts and Management. Springer, Dordrecht, 341–350. https://doi.org/10.1007/978-94-015-9956-6_35

Graf DL, Cummings KS (2018) The Freshwater Mussels (Unionoida) of the World (and other less consequential bivalves), updated 9 August 2018. MUSSEL Project Web Site. http://www.mussel-project.net

Gray JE (1825) A List and Description of some Species of Shells not taken Notice of by Lamarck. Annals of Philosophy, new series 9: 134–140. https://biodiversitylibrary.org/page/15880862

Gray JE (1840) A manual of the land and freshwater shells of the British Islands, with figures of each of the kinds. By William Turton, MD A new edition, thoroughly revised and much enlarged. Longman, Orme, Brown, Green, and Longmans, Paternoster Row, London, 324 pp. https://biodiversitylibrary.org/page/18243759

Gray JE (1843) Catalogue of the Species of Mollusca and their Shells, which have hitherto been recorded as found at New Zealand, with the Description of some lately discovered Species. In: Dieffenbach E (Ed.) Travels in New Zealand; with contributions to the geography, geology, botany, and natural history of that country. Vol. II. John Murray, London, 228–265. https://biodiversitylibrary.org/page/20760205

Grigorovich IA, Therriault TW, MacIsaac HJ (2003) History of aquatic invertebrate invasions in the Caspian Sea. Biological Invasions 5: 103–115. https://doi.org/10.1023/A:1024050824073

Grimm OA (1876) Kaspiyskoye more i yego fauna. Tetrad' 1. Trudy Aralo-Kaspiyskoy Ekspeditsii 2: 1–168. http://www.cawater-info.net/library/rus/hist/2_grimm.pdf

Grimm OA (1877) Kaspiyskoye more i yego fauna. Tetrad' 2. Trudy Aralo-Kaspiyskoy Ekspeditsii 2(2): 1–105. http://www.cawater-info.net/library/rus/hist/2_grimm.pdf

Grossu AV (1951) *Potamopyrgus jenkinsi*, gasteropod nou pentru apele continentale ale Republicii Populare Romine. Comunicarile Academiei Republicii Populare Române 1(7): 593–596.

Grossu AV (1973) Les Limnocardiides actuelles du Bassin Ponto-Caspique. Informations de la Société Belge de Malacologie 2(7–8): 123–152.

Grossu AV (1986) Le genre *Pseudamnicola* Paulaci, 1868 en Roumanie et description de quelques nouvelles espèces (Prosobranchia, Hydrobiidae). Apex. Informations scientifiques de la Société Belge de Malacologie 1(1): 7–17. http://www.biodiversitylibrary.org/item/129784#page/23/mode/1up

Haase M, Naser MD, Wilke T (2010) *Ecrobia grimmi* in brackish Lake Sawa, Iraq: indirect evidence for long-distance dispersal of hydrobiid gastropods (Caenogastropoda: Rissooidea) by birds. Journal of Molluscan Studies 76: 101–105. https://doi.org/10.1093/mollus/eyp051

Heiler KCM, Nahavandi N, Albrecht C (2010) A New Invasion Into an Ancient Lake – The Invasion History of the Dreissenid Mussel *Mytilopsis leucophaeata* (Conrad, 1831) and Its First Record in the Caspian Sea. Malacologia 53(1): 185–192. https://doi.org/10.4002/040.053.0112

Hilgendorf F (1867) Über *Planorbis multiformis* im Steinheimer Süßwasserkalk. Monatsberichte der Königlich-Preussischen Akademie der Wissenschaften zu Berlin 1866: 474–504.

ICZN (1999) International Code of Zoological Nomenclature. International Trust for Zoological Nomenclature, London, 306 pp. http://www.nhm.ac.uk/hosted-sites/iczn/code/index.jsp

Issel A (1865) Catalogo dei molluschi raccolti dalla missione italiana in Persia aggiuntavi la descrizione delle specie nuove o poco note. Stamperia Reale, Torino, 55 pp. http://magtecafi-ese.inera.it/unifi/opac/unifi/scheda.jsp?pid=mag:13023

Kadolsky D (2008) Mollusks from the Late Oligocene of Oberleichtersbach (Rhön Mountains, Germany). Part 2: Gastropoda. Neritimorpha and Caenogastropoda. Courier Forschungsinstitut Senckenberg 260: 103–137.

Kadolsky D (2012) Nomenclatural comments on non-marine molluscs occurring in the British Isles. Journal of Conchology 41(1): 65–90.

Kalitskiy KP (1914) Neftyanaya gora (Zakaspiyskaya oblast'). Trudy Geologicheskogo Komiteta 95: 1–78.

Kantor YuI, Sysoev AV (2006) Morskiye i solonovatovodnyye bryukhonogiye mollyuski Rossii i sopredel'nykh stran: illyustrirovannyy katalog. KMK Scientific Press, Moscow, 372 pp. [140 pls]

Kebapçı U, Van Damme D (2012) *Theodoxus fluviatilis* (errata version published in 2017). The IUCN Red List of Threatened Species 2012: e.T165352A113400624. https://doi.org/10.2305/IUCN.UK.2012-1.RLTS.T165352A1081028.en [Accessed on 05 December 2018]

Kevrekidis T, Wilke T, Mogias A (2005) When DNA puts ecological works back on the right track: genetic assessment and distribution patterns of mudsnail populations in the Evros Delta lagoons. Archiv für Hydrobiologie 162(1): 19–35. https://doi.org/10.1127/0003-9136/2005/0162-0019

Kijashko PV (2013) Glava 5. Mollyuski kaspiyskogo morya. In: Bogutskaya NG, Kijashko PV, Naseka AM, Orlova MI (Eds) Opredelitel' ryb i bespozvonochnykh Kaspiyskogo morya. T. 1. Ryby i mollyuski. KMK Scientific Press Ltd., St. Petersburg, Moscow.

Kohn, AJ (1972) *Conus miliaris* at Easter Island – ecological release of diet and habitat in an isolated population. American Zoologist 12: 712.

Kolesnikov VP (1947) Tablitsa dlya opredeleniya kaspiyskikh gastropod. Byulleten' Moskovskogo Obshchestva Ispytateley Prirody, otdel geologicheskiy 22(1): 105–112.

Kolesnikov VP (1950) Paleontologiya SSSR. Tom X, Chast' 3, Vyp. 12: Akchagyl'skie i apsheronskie mollyuski. Izdatel'stvo Akademii nauk SSSR, Moskva, Leningrad, 259 pp.

Kosarev AN, Yablonskaya EA (1994) The Caspian Sea. SPB Academic Publishing, The Hague, 259 pp.

Kostianoy AG, Kosarev AN (2005) The Caspian Sea Environment. Springer, Berlin, 271 pp. https://doi.org/10.1007/b138238

Krijgsman W, Tesakov A, Yanina T, Lazarev S, Danukalova G, Van Baak CGC, Agustí J, Alçiçek MC, Aliyeva E, Bista D, Bruch A, Büyükmeriç Y, Bukhsianidze M, Flecker R, Frolov P, Hoyle TM, Jorissen EL, Kirscher U, Koriche SA, Kroonenberg SB, Lordkipanidze D, Oms O, Rausch R, Singarayer J, Stoica M, van de Velde S, Titov VV, Wesselingh FP (2019) Quaternary time scales for the Pontocaspian domain: Interbasinal connectivity and faunal evolution. Earth-Science Reviews. https://doi.org/10.1016/j.earscirev.2018.10.013

Kroll O, Hershler R, Albrecht C, Terrazas EM, Apaza R, Fuentealba C, Wolff C, Wilke T (2012) The endemic gastropod fauna of Lake Titicaca: correlation between molecular evolution and hydrographic history. Ecology and Evolution 2(7): 1517–1530. https://doi.org/10.1002/ece3.280

Krynicki AJ (1837) Conchylia tam terrestria, quam fluviatilia et e maribus adjacentibus Imperii Rossici indigena, quae pro mutua offeruntur historiae naturalis cultoribus commutatione. Bulletin de la Société Impériale des Naturalistes de Moscou 10(2): 50–64. https://biodiversitylibrary.org/page/5521585

Küster HC (1852–1853) Die Gattungen *Paludina*, *Hydrocaena* und *Valvata*. In Abbildungen nach der Natur mit Beschreibungen. Systematisches Conchylien-Cabinet von Martini und Chemnitz 1(21). Bauer & Raspe, Nürnberg, 96 pp. https://biodiversitylibrary.org/page/34226358

Lamarck J-BPAdMd (1809) Philosophie Zoologique, ou exposition des considérations relatives à l'histoire naturelle des Animaux; à la diversité de leur organisation et des facultés qu'ils en obtiennent; aux causes physiques qui maintiennent en eux la vie et donnent lieu aux mouvements qu'ils exécutent; enfin à celles qui produisent les unes le sentiment, et les autres l'intelligence de ceux qui en sont doués. Dentu, Paris, 428 pp [Vol. 1]; 475 pp [Vol. 2].

Lamarck J-BPAdMd (1819) Histoire naturelle des animaux sans vertèbres, présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent; précédée d'une introduction offrant la détermination des caractères essentiels de l'animal, sa distinction du végétal et des autres corps naturels, enfin, l'exposition des principes fondomentaux de la zoologie. Tome sixième, première partie. Privately published, Paris, 343 pp. https://biodiversitylibrary.org/page/13181542

Latypov YuYa (2015) The Bivalve Mollusc *Abra ovata*: Role in Succession of Soft Bottom Communities on Newly Flooded Area of the Caspian Sea. American Journal of Climate Change 4: 239–247. https://doi.org/10.4236/ajcc.2015.43019

Leroy SAG, Chalié F, Wesselingh F, Sanjani S, Lahijani HAK, Athersuch J, Struck U, Plunkett G, Reimer PJ, Habibi P, Kabiri K, Haghani S, Naderi Beni A, Arpe K (2018) Multiproxy indicators in a Pontocaspian system: a depth transect of surface sediment in the S-E Caspian Sea. Geologica Belgica 21(3–4): 143–165. https://doi.org/10.20341/gb.2018.008

Lindholm VA (1901) Beiträge zur Kenntniss der Weichthierfauna Süd-Russlands. Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft 33(11–12): 161–186. https://biodiversitylibrary.org/page/15598704

Lindholm VA (1908) Materialien zur Molluskenfauena [sic] von Südwestrussland, Polen und der Krim. Zapiski Novorossijskago Obshchestva Estestvoispytatelej 31: 199–232.

Lindholm VA (1924) K nomenklature nekotorykh kaspiyskikh gastropod. Russkiy Gidrobiologicheskiy Zhurnal 3(1–2): 32–34.

Linnaeus C (1758) Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I. Editio decima, reformata. Laurentius Salvius, Holmiae, 824 pp. https://biodiversitylibrary.org/page/726886

Logvinenko BM, Starobogatov YaI (1966a) Novyye dvustvorchatyye mollyuski iz kaspiyskoy profundali. Nauchnyye doklady vysshey shkoly. Biologicheskiye nauki 2: 13–16.

Logvinenko BM, Starobogatov YaI (1966b) Mollyuski semeystva Planorbidae Kaspiya. Zoologicheskiy Zhurnal 45(10): 1467–1475.

Logvinenko BM, Starobogatov YaI (1967) K izucheniyu vidovogo sostava fauny dvustvorchatykh mollyuskov tanatotsenozov podvodnogo sklona Azerbaydzhanskogo poberezh'ya Kaspiya. In: Kudritskiy DM (Ed.) Opyt geologo-geomorfologicheskikh i gidrobiologicheskikh issledovaniy beregovoy zony morya. Nauka, Leningrad, 225–235.

Logvinenko BM, Starobogatov YaI (1969) Mollusca. In: Birshtein YaA, Vinogradov LG, Kondakov NN, Kuhn MS, Astakhova TV, Romanova NN (Eds) Atlas bespozvonochnykh Kaspiyskogo morya. Pishchevaya Promyshlennost (Vsesoyuznyi Nauchno-issledovatel'skii Institut Morskogo Rybnogo Khozyaistva i Okeanografii), Moskva, 308–385.

Mabille J (1877) Catalogue des Paludestrines des côtes de France. Revue et Magasin de Zoologie, 3e Série 5: 214–222. https://biodiversitylibrary.org/page/33779087

Mainguet M, Létolle R (1997) The Ecological Crisis of the Aral Sea Basin in the Frame of a New Time Scale: The "Anthropo-Geological Scale". Naturwissenschaften 84(8): 331–339. https://doi.org/10.1007/s001140050406

Makarov AK (1938) Rasprostraneniye nekotorykh rakoobraznykh (Mysidacea, Cumacea) i limannykh mollyuskov v ust'yakh i otkrytykh limanakh Severnogo Prichernomor'ya. Zoologicheskiy Zhurnal 17(6): 1055–1062.

Martens Ev (1874) Ueber vorderasiatische Conchylien nach den Sammlungen des Prof. Hausknecht. Novitates conchologicae. Supplement 5: 1–127. https://biodiversitylibrary.org/page/12980992

Matthews SC (1973) Notes on open Nomenclature and on Synonymy Lists. Palaeontology 16(4): 713–719. https://www.palass.org/sites/default/files/media/publications/palaeontology/volume_16/vol16_part4_pp713-719.pdf

Micklin P, Aladin NV, Plotnikov I (2014) The Aral Sea. The Devastation and Partial Rehabilitation of a Great Lake. Springer, Berlin, 453 pp.

Milaschewitch KO (1908) Mollyuski, sobrannyye vo vremya ekskursii S.A. Zernova na minonostse No. 264 na r. Dunay s 28 iyunya po 3 iyulya 1907 goda. Bulletin de l'Académie Impériale des Sciences de St.-Pétersbourg, sixième série 2(12): 991–996.

Milaschewitch KO (1916) Mollyuski russkikh morey. Tom 1. Mollyuski Chernago i Azovskago morey. Imperatorskaya Akademiya Nauk, Zoologicheskiy Muzey, Petrograd, 312 pp. http://www.biodiversitylibrary.org/item/44223

Mirzoev GS, Alekperov IH (2017) Zoobenthos distribution patterns in the deepwater horizon of Azerbaijan sector of the Caspian Sea. International Journal of Zoological Studies 2: 43–48. http://www.zoologyjournals.com/download/74/1-7-29-696.pdf

MolluscaBase (2018a) MolluscaBase. http://www.molluscabase.org [Accessed on 2018-09-28]

MolluscaBase (2018b) *Adacna fragilis* Milaschewitch, 1908. World Register of Marine Species. http://marinespecies.org/aphia.php?p=taxdetails&id=381870 [Accessed on 2018-09-05]

Montagu G (1803) Testacea Britannica, or natural history of British shells, marine, land, and fresh-water, including the most minute: systematically arranged and embellished with figures. White, London, 606 pp. https://biodiversitylibrary.org/page/24430071

Mordukhay-Boltovskoy FD (1960) Kaspiyskaya fauna v Azovo-Chernomorskom basseyne. Izdatel'stvo Akademii Nauk SSSR, Leningrad, 228 pp.

Mousson A (1863) Coquilles terrestres et fluviatiles, recueillies dans l'Orient par M le Dr Alex Schläfli. Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich 8: 275–320, 368–426. https://biodiversitylibrary.org/page/8403222

Müller OF (1773–1774) Vermium terrestrium et fluviatilium historia, seu animalium Infusoriorum, Helminthicorum et Testaceorum non marinorum succincta historia. Volumen alterum. Heineck & Faber, Havniae et Lipsiae, 214 pp. https://biodiversitylibrary.org/page/32096857

Munasypova-Motyash IA (2006a) O sovremennoy faune dvustvorchatykh mollyuskov podsemeystva Limnocardiinae (Bivalvia, Cardiidae) Severo-Zapadnogo Prichernomor'ya. Vestnik Zoologii 40(1): 41–48. http://dspace.nbuv.gov.ua/bitstream/handle/123456789/9419/03_Munasipova.pdf?sequence=3

Munasypova-Motyash IA (2006b) Morfometricheskiye priznaki rakoviny dvustvorchatykh mollyuskov podsemeystva Limnocardiinae (Bivalvia, Cardiidae) i ikh znacheniye v taksonomii gruppy. Vestnik Zoologii 40(6): 521–527. http://www.v-zool.kiev.ua/pdfs/2006/6/05_Munasypova.pdf

Nabozhenko MV, Nabozhenko SV (2016) *Corbicula fluminalis* (O.F. Müller, 1774) – novyy dlya rossiyskogo sektora kaspiyskogo basseyna vid dvustvorchatykh mollyuskov. Nauka Yuga Rossii (Vestnik Yuzhnogo Nauchnogo Tsentra) 12(1): 61–64. http://www.ssc-ras.ru/ckfinder/userfiles/files/61-64_Nabozhenko_1_2016.pdf

Nalivkin DV (1915) Mollyuski gory Bakinskogo yarusa. Trudy Geologicheskogo Komiteta, novaya seriya 116: 1–32.

Nalivkin DV, Anisimov A (1914) Opisaniye glavneyshikh mestnykh form roda *Didacna* Eichwald iz postpliotsena Apsheronskogo poluostrova. Trudy Geologicheskogo Komiteta, novaya seriya 117: 1–22.

Neubauer TA, van de Velde S, Yanina TA, Wesselingh FP (2018) A late Pleistocene gastropod fauna from the northern Caspian Sea with implications for Pontocaspian gastropod taxonomy. ZooKeys 770: 43–103. https://doi.org/10.3897/zookeys.770.25365

Nevesskaja LA (1958) Chetvertichnyye morskiye mollyuski Turkmenii. Trudy Paleontologicheskogo Instituta 65: 1–82.

Nevesskaja LA (1963) Opredelitel' dvustvorchatykh mollyuskov morskikh chetvertichnykh otlozheniy Chernomorskogo basseyna. Trudy Paleontologicheskogo Instituta 96: 1–211.

Nevesskaja LA (1965) Pozdnechetvertichnyye dvustvorchatyye mollyuski Chernogo morya, ikh sistematika i ekologiya. Trudy Paleontologicheskogo Instituta 105: 1–391.

Nevesskaja LA (2007) History of the Genus *Didacna* (Bivalvia: Cardiidae). Paleontological Journal 41(9): 861–949. https://doi.org/10.1134/S0031030107090018

Nikula R, Väinölä R (2003) Phylogeography of *Cerastoderma glaucum* (Bivalvia: Cardiidae) across Europe: a major break in the Eastern Mediterranean. Marine Biology 143(2): 339–350. https://doi.org/10.1007/s00227-003-1088-6

Occhipinti-Ambrogi A, Savini D (2003) Biological invasions as a component of global change in stressed marine ecosystems. Marine Pollution Bulletin 46(5): 542–551. https://doi.org/10.1016/S0025-326X(02)00363-6

Orlova MI, Muirhead JR, Antonov PI, Shcherbina GKh, Starobogatov YaI, Biochino GI, Therriault TW, MacIsaac HJ (2005) Range expansion of quagga mussels *Dreissena rostriformis bugensis* in the Volga River and Caspian Sea basin. Aquatic Ecology 38(4): 561–573. https://doi.org/10.1007/s10452-005-0311-6

Osikowski A, Hofman S, Georgiev D, Kalcheva S, Falniowski A (2016) Aquatic snails *Ecrobia maritima* (Milaschewitsch, 1916) and *E. ventrosa* (Montagu, 1803) (Caenogastropoda: Hydrobiidae) in the East Mediterranean and Black Sea. Annales Zoologici 66(3): 477–486. https://doi.org/10.3161/00034541ANZ2016.66.3.012

Ostroumov AA (1905) Poyezdka na Kaspiy. Trudy Obshchestva yestestvoispytateley pri Kazanskom universitete 39(6): 1–84.

Ostroumov A (1907) O mollyuskakh Aralskago morya. Izvestiya Turkestanskogo otdela Imperatorskogo Russkogo Geograficheskogo Obshchestva 4: 20–26. https://lib.rgo.ru/reader/flipping/Resource-9382/RuPRLIB12047877/index.html

Paladilhe A (1867) Nouvelles Miscellanées malacologiques. Revue et magasin de zoologie pure et appliquée, deuxième série 19: 88–95. https://biodiversitylibrary.org/page/2704268

Paladilhe A (1869) Descriptions de quelques Paludinées, Assiminidées et Mélanidées. Revue et Magasin de Zoologie Pure et Appliquée, deuxième série 21: 225–237, 273–284, 316–325, 379–383. https://biodiversitylibrary.org/page/33749249

Pallas PS (1771) Reise durch verschiedene Provinzen des Rußischen Reichs. Erster Theil. Kayserliche Academie der Wissenschaften, St. Petersburg, 504 pp. http://resolver.sub.uni-goettingen.de/purl?PPN329913735

Pfeiffer C (1828) Naturgeschichte deutscher Land- und Süsswasser-Mollusken. Dritte Abtheilung. Landes-Industrie-Comptoir, Weimar, 84 pp. https://opacplus.bsb-muenchen.de/search?oclcno=229922635&db=100&View=default

Philippi RA (1836) Enumeratio Molluscorum Siciliae cum viventium tum in tellure teriaria fossilium, quae in itinere suo observavit. Vol. 1. Simon Schropp, Berlin, 267 pp. http://reader.digitale-sammlungen.de/de/fs2/object/display/bsb10231737_00007.html

P*irogov* VV (1971) O nakhozhdenii novogo vida mollyuska iz roda Pyrgula Crist. et Jan. v avandel'tye reki Volgi. Trudy Astrakhanskogo Zapovednika imeni V.I. Lenina 13: 249–253.

Plaziat J-C (1991) Paleogeographic significance of the Cardium, Potamids and Foraminifera living in intra-continental salt lakes of North Africa (Sahara Quaternary, Egypt Present lakes). Journal of African Earth Sciences (and the Middle East) 12(1–2): 383–389.https://doi.org/10.1016/0899-5362(91)90087-F

Plotnikov IS, Ermakhanov ZK, Aladin NV, Micklin P (2016) Modern state of the Small (Northern) Aral Sea fauna. Lakes & Reservoirs: Science, Policy and Management for Sustainable Use 21(4): 315–328. https://doi.org/10.1111/lre.12149

Poiret JLM (1789) Voyage en Barbarie, ou Lettres écrites de l'Ancienne Numidie. Pendant les années 1785 & 1786, sur la Religion, les Contumes & les Moeurs des Maures des Arabes-Bédouins; avec un Essai sur l'Histoire Naturelle de ce pays. Seconde partie. JBF Née de la Rochelle, Paris, 319 pp. https://biodiversitylibrary.org/page/13528290

Poli IX (1795) Testacea utriusque Siciliae eorumque historia et anatome tabulis aeneis illustrata. Tomus secundus. Regio Typographeio, Parma, 75–264. [pls 19–39] http://*gallica.bnf.fr/ark:/12148*/bpt6k98950s/f1.image

Ponder WF (1988) Potamopyrgus antipodarum – a molluscan coloniser of Europe and Australia. Journal of Molluscan Studies 54(3): 271–285. https://doi.org/10.1093/mollus/54.3.271

Popa L, Popa O, Iorgu E, Kelemen B, Murariu D (2012) Molecular insights into the taxonomy of Hypanis (Bivalvia, Cardiidae, Lymnocardiinae) in the Black Sea lagoons. Helgoland Marine Research 66(2): 153–158. https://doi.org/10.1007/s10152-011-0256-1

Popa OP, Sárkány-Kiss A, Kelemen B, Iorgu EI, Murariu D, Popa LO (2009) Contributions to the knowledge of the present Limnocardiinae fauna (Mollusca: Bivalvia) from Romania. Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa" 52: 7–15.

Popov GI (1983) Pleystotsen Chernomorsko-Kaspiyskikh prolivov (stratigrafiya, korrelyatsiya, paleofaunistika, geologicheskaya istoriya). Nauka, Moskva, 216 pp.

Pravo*slavlev PA (1950) N*ekotoryye zamechaniya o gruppe sovremennykh Didacna trigonoides Pall. Uchenyye zapiski Leningradskogo Gosudarstvennogo Universiteta, seriya geologichekskikh nauk 102(1): 20–27.

Prié V (2011) *Heleobia stagnorum*. The IUCN Red List of Threatened Species 2011: e.T155989A4879741.https://doi.org/10.2305/IUCN.UK.2011-2.RLTST155989A4879741.en [Accessed on 05 December 2018]

Put' AL (1972) Do vyvchennya lunkovykh (Neritidae) Ukrayini. Dopovidi Akademii Nauk Ukrainskoi SSR, Seriya B, Geologiya, Khimiya, Biologiya 1: 78–83.

Radoman P (1973) New classification of fresh and brakish water Prosobranchia from the Balkans and Asia Minor. Prirodnjacki Muzej u Beogradu, Posebna Izdanja 32: 3–30.

Radoman P (1977) Hydrobiidae auf der Balkanhalbinsel und in Kleinasien. Archiv für Molluskenkunde 107(4/6): 203–223.

Rafinesque CS (1815) Analyse de la nature ou tableau de l'univers et des corps organisés. Privately published by author, Palermo, 223 pp. http://gallica.bnf.fr/ark:/12148/bpt6k98061z

Récluz CA (1843) Monographie du genre *Syndosmya*. Revue Zoologique, par la Société Cuvierienne 6: 359–369. http://biodiversitylibrary.org/page/2271434

Reeve LA (1844–1845) Monograph of the genus *Cardium*. In: Reeve LA (Ed.) Conchologia Iconica: or, Illustrations of the Shells of Molluscous Animals. Vol. II. Privately published, London, 22 pp. https://biodiversitylibrary.org/page/8937393

Rosenberg G, Ludyanskiy ML (1994) A Nomenclatural Review of *Dreissena* (Bivalvia: Dreissenidae), with Identification of the Quagga Mussel as *Dreissena bugensis*. Canadian Journal of Fisheries and Aquatic Sciences 51: 1474–1484. https://doi.org/10.1139/f94-147

Scarlato OA, Starobogatov YaI (1972) Klass dvustvorchatyye mollyuski. In: Mordukhay-Boltovskoy FD (Ed.) Opredelitel' fauny Chernogo i Azovskogo morey: Svobodnozhivushchiye bespozvonochnyye. T.3. Chlenistonogiye (krome rakoobraznykh), Mollyuski, Iglokozhiye, Shchetinkochelyustnyye, Khordovyye. Naukova dumka, Kiev, 178–249.

Schultze FTS (1826) Catalog der Conchylien-Sammlung des verstorbenen Herrn Ober-Einnehmers Freiherrn von der Malsburg, in deren Besitz sich jetzt befindet der Herr Kammerherr Baron v. d. Malsburg zu Escheberg bei Cassel in Cur-Hessen. Berlin, 199 pp.

Seddon MB, Van Damme, D (2016) *Corbicula fluminalis*. The IUCN Red List of Threatened Species 2016: e.T98201936A98201989. https://doi.org/10.2305/IUCN.UK.2016-3.RLTS.T98201936A98201989.en [Accessed on 20 October 2018]

Selifonova JP (2008a) Functioning of the Sea of Azov ecosystem. Inland Water Biology 1(3): 199–203. https://doi.org/10.1134/S1995082908030012

Selifonova ZhP (2008b) Taxonomic composition and interannual variations in numerical density of meroplankton in the Sea of Azov. Russian Journal of Marine Biology 34(5): 263–269. https://doi.org/10.1134/S1063074008050015

Shalovenkov N (2005) Restoration of Some Parameters in the Development of Benthos After Reduction of Anthropogenous Loading in the Ecosystem of the Sevastopol Bay in the Black Sea. Mitigation and Adaptation Strategies for Global Change 10(1): 105–113. https://doi.org/10.1007/s11027-005-7833-z

Shishkoedova OS (2010) Pervaya nakhodka mollyuskov roda *Caspiohydrobia* (Mollusca: Gastropoda) v Chelyabinskoy oblasti. [Ecology: from the southern mountains to the northern seas. Materials of the young scientists' meeting, 19–23 April, 2010, Yekaterinburg.] Goschchitsky Publisher, Yekaterinburg, 210–213. [in Russian]

Sitnikova TYa, Starobogatov YaI (1999) Novyy rod semeystva Pyrgulidae (Gastropoda, Pectinibranchia) iz presnykh vod Azovo-Chernomorskogo basseyna (v svyazi s voprosom o Ponto-Kaspiyskikh vidakh v Azovo-Chernomorskom basseyne). Zoologicheskiy Zhurnal 78(2): 158–163.

Son M (2011a) *Caspiagmelinii*. The IUCN Red List of Threatened Species 2011: e.T155474A4782113. https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T155474A4782113.en [Accessed on 05 December 2018]

Son M (2011b) *Caspia knipowitchi*. The IUCN Red List of Threatened Species 2011: e.T156116A4900657. https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T156116A4900657.en [Accessed on 05 December 2018]

Son M (2011c) *Caspiamakarovi*. The IUCN Red List of Threatened Species 2011: e.T155680A4822960. https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T155680A4822960.en [Accessed on 05 December 2018]

Son M (2011d) *Turricaspia chersonica*. The IUCN Red List of Threatened Species 2011: e.T155738A4835520.https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T155738A4835520.en [Downloaded on 05 December 2018]

Son M (2011e) *Turricaspia lincta*. The IUCN Red List of Threatened Species 2011: e.T155627A4811075. https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T155627A4811075.en [Accessed on 05 December 2018]

Son M, Cioboiu O (2011) *Turricaspia ismailensis*. The IUCN Red List of Threatened Species 2011: e.T155600A4806726. https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T155600A4806726.en [Accessed on 05 December 2018]

Sromek L, Forcioli D, Lasota R, Furla P, Tarnowska-Marini K, Wolowicz M, Chenuil A (2016) Strong genetic structuring of the cockle *Cerastoderma glaucum* across Europe: new insights from an intronic marker and multivariate analysis. Journal of Molluscan Studies 82(4): 515–524. https://doi.org/10.1093/mollus/eyw019

Starobogatov YaI (1968) Prakticheskiye priyomy sistematiki i vopros o kriterii vida. Zoologicheskiy Zhurnal 47(6): 875–886.

Starobogatov YaI (1970) Fauna mollyuskov i zoogeographicheskoye rayonirovaniye kontinental'nykh vodoemov zemnogo shara. Nauka, Leningrad, 372 pp.

Starobogatov YaI (1974) Phylum Mollusca. In: Mordukhay-Boltovskoy FD (Ed.) Atlas bespozvonochnykh Aral'skogo Morya. Pishchevaya Promyshlennost', Moscow, 237–257.

Starobogatov YaI (2000) Caspian endemic genus *Andrusovia* (Gastropoda Pectinibranchia Horatiidae). Ruthenica 10(1): 37–42.

Starobogatov YaI, Filchakov VA, Antonova LA, Pirogov VV (1994) Novyye dannyye o mollyuskakh i vysshikh rakoobraznykh delty Volgi. Vestnik Zoologii 4–5: 8–12.

Starobogatov YaI, Prozorova LA, Bogatov VV, Sayenko EM (2004) Mollyuski. In: Tsalolikhin SJ (Ed.) Opredelitel' presnovodnykh bespozvonochnykh Rossii i sopredel'nykh territoriy. T. 6. Mollyuski, Polikhety, Nemertiny. Izdatel'stvo "Nauka", St. Petersburg, 9–491.

Stepien CA, Grigorovich IA, Gray MA, Sullivan TJ, Yerga-Woolwine S, Kalayci G (2013) Evolutionary, Biogeographic, and Population Genetic Relationships of Dreissenid Mussels, with Revision of Component Taxa. In: Nalepa TF, Schloesser DW (Eds) Quagga and Zebra Mussels: Biology, Impacts, and Control. 2nd edition. CRC Press, Boca Raton, 403–444. https://doi.org/10.1201/b15437-33

Stimpson W (1865) Researches upon the Hydrobiinae and allied forms: chiefly made from materials in the Museum of the Smithsonian Institution. Smithsonian Miscellaneous Collections 7: 1–59. https://biodiversitylibrary.org/page/8817453

Stolberg FV, Borysova O, Mitrofanov I, Barannik V, Eghtesadi P (2006) Global International Water Assessment 23. Caspian Sea. University of Kalmar (on behalf of United Nations Environment Programme). Kalmar, 71 pp.

Stoliczka F (1870–1871) Cretaceous fauna of southern India. The Pelycopoda, with a review of all known Genera of this class, fossil and recent. Palaeontologia Indica, being figures and description s of the organic remains procured during the progress of the Geological Survey of India. Memoirs of the Geological Survey of India 6(3): 1–538.

Svitoch AA (1967) Atlas-opredelitel' mollyuskov roda *Didacna* Eichwald iz chetvertichnykh otlozheniy Tsentral'nogo Prikaspiya. Nedra, Moskva, 87 pp.

Tadjalli-Pour M (1977) Les Mollusques marins des côtes Iraniennes de la Mer Caspienne (Astara-Hachtpar). Journal de Conchyliologie 114(3–4): 87–117.

Taviani M, Angeletti L, Çagatay MN, Gasperini L, Polonia A, Wesselingh FP (2014) Sedimentary and faunal signatures of the post-glacial marine drowning of the Pontocaspian Gemlik "lake" (Sea of Marmara). Quaternary International 345: 11–17. https://doi.org/10.1016/j.quaint.2014.05.045

Therriault TW, Docker MF, Orlova MI, Heath DD, MacIsaac HJ (2004) Molecular resolution of the family Dreissenidae (Mollusca: Bivalvia) with emphasis on Ponto-Caspian species, including first report of *Mytilopsis leucophaeata* in the Black Sea basin. Molecular Phylogenetics and Evolution 30(3): 479–489. https://doi.org/10.1016/S1055-7903(03)00240-9

Thiele J (1925–1926) Mollusca = Weichtiere. In: Kükenthal W, Krumbach T (Eds) Handbuch der Zoologie. De Gruyter, Berlin & Leipzig, 15–266.

Tomovic J, Bodon M, Giusti F, Manganelli G, Cioboiu O, Beran L (2010) *Theodoxus danubialis*. The IUCN Red List of Threatened Species 2010: e.T165349A6005150. [Accessed on 05 December 2018]

Tryon GW (1866) [Book review of] Researches upon the Hydrobiinae and allied forms by Dr. Wm. Stimpson, 8 vol. Smithsonian Institution, Washington DC, August 1865, 58 p. American Journal of Conchology 2(2): 152–158. https://biodiversitylibrary.org/page/6660366

UNEP [United Nations Environment Programme] (2006) Annual Report. https://wedocs.unep.org/bitstream/handle/20.500.11822/7476/-UNEP%202006%20Annual%20Report-2007755.pdf

Van Damme D (2011a) *Hydrobia ventrosa*. The IUCN Red List of Threatened Species 2011: e.T155734A4834019.https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T155734A4834019.en [Accessed on 05 December 2018]

Van Damme D (2011b) *Lithoglyphus naticoides*. The IUCN Red List of Threatened Species 2011: e.T155563A4798694. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T155563A4798694.en [Accessed on 05 December 2018]

Van Damme D (2013) *Potamopyrgus antipodarum*. The IUCN Red List of Threatened Species 2013: e.T155980A738398. https://doi.org/10.2305/IUCN.UK.2013-2.RLTS.T155980A738398.en [Accessed on 05 December 2018]

Van Damme D (2014) *Dreissena polymorpha*. The IUCN Red List of Threatened Species 2014: e.T155495A42428801.http://dx.doi.org/10.2305/IUCN.UK.2014-3.RLTS.T155495A42428801.en. [Accessed on 05 December 2018]

Van Damme D, Kebapçı U (2014) *Theodoxus pallasi*. The IUCN Red List of Threatened Species 2014: e.T165355A42421481. https://doi.org/10.2305/IUCN.UK.2014-3.RLTS.T165355A42421481.en [Accessed on 05 December 2018]

Vekilov BG (1969) Antropogenovyye otlozheniya severo-vostochnogo Azerbaydzhana. Elm, Baku, 260 pp.

Vinarski MV (2011a) *Anisus kolesnikovi*. The IUCN Red List of Threatened Species 2011: e.T189408A8727730. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189408A8727730.en [Accessed on 05 December 2018]

Vinarski MV (2011b) *Caspiohydrobia grimmi*. The IUCN Red List of Threatened Species 2011: e.T189337A8717931. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189337A8717931.en [Accessed on 05 December 2018]

Vinarski MV (2011c) *Pseudamnicola brusiniana*. The IUCN Red List of Threatened Species 2011: e.T189051A8685851. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189051A8685851.en [Accessed on 05 December 2018]

Vinarski MV (2011d) *Pseudamnicola depressispira*. The IUCN Red List of Threatened Species 2011: e.T189477A8737258. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189477A8737258.en [Accessed on 05 December 2018]

Vinarski MV (2011e) *Pyrgula abichi*. The IUCN Red List of Threatened Species 2011: e.T189305A8713559.https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189305A8713559.en [Accessed on 05 December 2018]

Vinarski MV (2011f) *Pyrgula behningi*. The IUCN Red List of Threatened Species 2011: e.T189386A8724662. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189386A8724662.en [Accessed on 05 December 2018]

Vinarski MV (2011g) *Pyrgula cincta*. The IUCN Red List of Threatened Species 2011: e.T189385A8724527. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189385A8724527.en [Accessed on 05 December 2018]

Vinarski MV (2011h) *Pyrgula ebersini*. The IUCN Red List of Threatened Species 2011: e.T189454A8734554. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189454A8734554.en [Accessed on 05 December 2018]

Vinarski MV (2011i) *Pyrgula grimmi*. The IUCN Red List of Threatened Species 2011: e.T189124A8688657. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189124A8688657.en [Accessed on 05 December 2018]

Vinarski MV (2011j) *Pyrgula isseli*. The IUCN Red List of Threatened Species 2011: e.T189070A8673755. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189070A8673755.en [Accessed on 05 December 2018]

Vinarski MV (2011k) *Pyrgula kolesnikoviana*. The IUCN Red List of Threatened Species 2011: e.T189244A8705915. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189244A8705915.en [Accessed on 05 December 2018]

Vinarski MV (2011l) *Pyrgula nossovi*. The IUCN Red List of Threatened Species 2011: e.T189508A8741457. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189508A8741457.en [Accessed on 05 December 2018]

Vinarski MV (2011m) *Pyrgula pulla*. The IUCN Red List of Threatened Species 2011: e.T189458A8735062.https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189458A8735062.en [Accessed on 05 December 2018]

Vinarski MV (2011n) *Pyrgula rudis*. The IUCN Red List of Threatened Species 2011: e.T188922A8662920.https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T188922A8662920.en [Accessed on 05 December 2018]

Vinarski MV (2011o) *Pyrgula sowinskyi*. The IUCN Red List of Threatened Species 2011: e.T189266A8708984.https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189266A8708984.en [Accessed on 05 December 2018]

Vinarski MV (2011p) *Turricaspia conus*. The IUCN Red List of Threatened Species 2011: e.T189262A8708478.https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189262A8708478.en [Accessed on 05 December 2018]

Vinarski MV (2011q) *Turricaspia astrachanica*. The IUCN Red List of Threatened Species 2011: e.T188872A8655897. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T188872A8655897.en [Accessed on 05 December 2018]

Vinarski MV (2011r) *Turricaspia dagestanica*. The IUCN Red List of Threatened Species 2011: e.T189097A8680601. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189097A8680601.en [Accessed on 05 December 2018]

Vinarski MV (2011s) *Turricaspia pullula*. The IUCN Red List of Threatened Species 2011: e.T189467A8736127.https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189467A8736127.en [Accessed on 05 December 2018]

Vinarski MV (2011t) *Turricaspia sajenkovae*. The IUCN Red List of Threatened Species 2011: e.T189280A8710891. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189280A8710891.en [Accessed on 05 December 2018]

Vinarski MV (2011u) *Turricaspia spasskii*. The IUCN Red List of Threatened Species 2011: e.T189404A8727214. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189404A8727214.en [Accessed on 05 December 2018]

Vinarski MV (2012) *Turricaspia caspia*. The IUCN Red List of Threatened Species 2012: e.T189493A1927211.https://doi.org/10.2305/IUCN.UK.2012-1.RLTS.T189493A1927211.en [Accessed on 05 December 2018]

Vinarski MV (2018) The species question in freshwater malacology: from Linnaeus to the present day. Folia Malacologica 26(1): 39–52. https://doi.org/10.12657/folmal.026.005

Vinarski MV, Karimov AV, Litvinov KV, Podoliako SA (2018) Presnovodnaya malakofauna Astrakhanskogo zapovednika: Vzglyad iz 21-go veka. Trudy Astrakhanskogo Gosudarstvennogo Prirodnogo Biosfernogo Zapovednika. Astrakhan' 17: 65–87.

Vinarski MV, Kantor YuI (2016) Analytical catalogue of fresh and brackish water molluscs of Russia and adjacent countries. A.N. Severtsov Institute of Ecology and Evolution of RAS, Moscow, 544 pp.

Vinarski MV, Nekhaev IO, Glöer P, Proschwitz Tv (2013) Type materials of freshwater gastropod species described by CA Westerlund and accepted in current malacological taxonomy: a taxonomic and nomenclatorial study. Ruthenica 23(2): 79–108. http://www.ruthenica.com/documents/VOL23_Vinarski_et_al_79-108_standard.pdf

von Rintelen T, Van Damme D (2011a) *Dreissena bugensis*. The IUCN Red List of Threatened Species 2011: e.T188911A8661357. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T188911A8661357.en [Accessed on 05 December 2018]

von Rintelen T, Van Damme D (2011b) *Dreissena caspia*. The IUCN Red List of Threatened Species 2011: e.T188971A8669278. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T188971A8669278.en [Accessed on 06 September 2018]

von Rintelen T, Van Damme D (2011c) *Dreissena rostriformis*. The IUCN Red List of Threatened Species 2011: e.T189369A8722237. https://doi.org/10.2305/IUCN.UK.2011-2.RLTS.T189369A8722237.en [Accessed on 05 December 2018]

Welter-Schultes FW (2012) European non-marine molluscs, a guide for species identification. Planet Poster Editions, Göttingen, 679 pp.

Westerlund CA (1896) Neue centralasiatische Mollusken. Ezhegodnik Zoologicheskogo Muzeya Imperatorskoy Akademii Nauk 1(3): 181–198.https://biodiversitylibrary.org/page/9006596

Westerlund CA (1902a) Malacologische Bemerkungen und Beschreibungen. Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft 34: 35–47. https://biodiversitylibrary.org/page/15598774

Westerlund CA (1902b) Methodus dispositionis Conchyliorum extramarinorum in Regione palaearctica viventium, familias, genera, subgenera et stirpes sistens. Rad Jugoslavenske Akademije Znanosti i Umjetnosti 151: 82–139. http://dizbi.hazu.hr/object/view/km6Jc2154m

Wilke T, Albrecht C, Anistratenko VV, Sahin SK, Yildirim MZ (2007) Testing biogeographical hypotheses in space and time: faunal relationships of the putative ancient Lake Egirdir in Asia Minor. Journal of Biogeography 34: 1807–1821. https://doi.org/10.1111/j.1365-2699.2007.01727.x

Wilke T, Delicado D [in press] Hydrobiidae Stimpson, 1865. In: Lydeard C, Cummings KS (Eds) Freshwater Mollusks of the World. A Distribution Atlas. John Hopkins University Press, Baltimore.

Yakhimovich VL, Nemkova VK, Dorofeev PI, Popova-Lvova MG, Suleimanova FI, Khabibullina GA, Alimbekova LI, Latypova EK (1986) Pleystotsen nizhnego techeniya r. Ural. BFAN SSSR, Ufa, 135 pp.

Yanina TA (2005) Didakny Ponto-Kaspiya. Majenta, Smolensk-Moskva, 300 pp.

Yanina TA (2009) Paleogeografiya basseynov Ponto-Kaspiya v pleystotsene po rezul'tatam malakofaunisticheskogo analiza. Moscow State University, Moscow. http://www.geogr.msu.ru/structure/labs/notl/personal/Abstracts/Yanina_avtoreferat.2009.pdf

Yanina TA, Svitoch AA (1988) Pleystotsenovyye mollyuski Dagestana (opredelitel' roda *Didacna* Eichwald). VINITI, Moscow, 180 pp.

Zaitsev Yu, Mamaev V (1997) Marine Biological Diversity in the Black Sea: A Study of Change and Decline. United Nations Publications, New York, 208 pp.

Zaranko DT, Farara DG, Thompson FG (1997) Another exotic mollusc in the Laurentian Great Lakes: the New Zealand native *Potamopyrgus antipodarum* (Gray 1843) (Gastropoda, Hydrobiidae). Canadian Journal of Fisheries and Aquatic Sciences 54(4): 809–814. https://doi.org/10.1139/f96-343

Zettler ML (2007) A redescription of *Theodoxus schultzii* (Grimm, 1877), an endemic neritid gastropod of the Caspian Sea. Journal of Conchology 39(3): 245–251.

Zhadin VI (1952) Mollyuski presnykh i solonovatykh vod SSSR. Izdatel'stvo Akademii Nauk SSSR, Moskva, Leningrad, 376 pp.

Zhizhchenko BP (1933) Fauna kaspiyiskikh terras. In: Archangelsky AD, Davitashvili LS (Eds) Rukovodyashchiye iskopayemyye neftyenosnykh rayonov Krymsko-Kavkazskoy oblasti, XV. Trudy Gosudarstvennogo Issledovatel'skogo Neftyanogo Instituta 1933: 30–36.

Zhulidov AV, Zhulidov DA, Pavlov DF, Nalepa TF, Gurtovaya TYu (2005) Expansion of the invasive bivalve mollusk *Dreissena bugensis* (quagga mussel) in the Don and Volga River Basins: Revisions based on archived specimens. Ecohydrology & Hydrobiology 5(2): 127–133. https://www.glerl.noaa.gov/pubs/fulltext/2005/20050013.pdf

Zolotarev V (1996) The Black Sea ecosystem changes related to the introduction of new mollusc species. Marine Ecology 17(1–3): 227–236. https://doi.org/10.1111/j.1439-0485.1996.tb00504.x